HARVARD

OCTOBER, 1902. VOL. XX. No. 4.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

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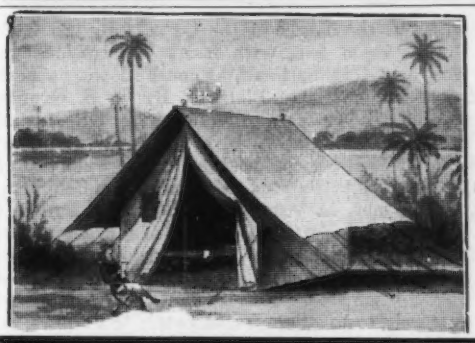

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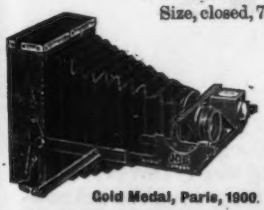

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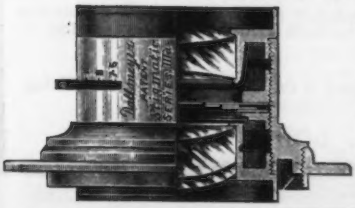

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The
Geographical Journal.

No. 4. OCTOBER, 1902. Vol. XX.

FROM THE SOMALI COAST THROUGH SOUTHERN ETHIOPIA TO THE SUDAN.*

By OSCAR NEUMANN.

In the spring of 1899 Baron Carlo von Erlanger asked me to join an expedition to Somaliland, which he intended to undertake for the sake of sport and ornithological research. I agreed on condition that the journey should not be confined to Somaliland, but should also extend to the countries of Southern Ethiopia. The preparations took nearly half a year. Meanwhile the revolt of the mad Mulla had broken out, and the western route proposed by myself proved to be the only one possible, as the Foreign Office was forced to recall its permission to penetrate the hinterland of Berbera, and we were therefore obliged to set out from Zeila by the old caravan route to Harar. The members of the expedition were Baron Carlo von Erlanger, Dr. Hans Ellenbeck as physician, Mr. Johann Holtermuller as cartographer, Mr. Carl Hilgert as taxidermist, and myself.

We started from Zeila on January 12, 1900, but an accident to Mr. Carl Hilgert, who nearly killed himself with a small flaubert gun, stopped us at the wells of Dadab, only three marches from the coast, so that we did not arrive at Harar until the beginning of March.

In the desert Baron Erlanger and myself preceded the caravan in order to meet Mr. Alfred Ilg, the foreign minister of the Emperor Menelik, who was on his way to the coast, and to whose valuable help a great part of the success of our expedition is due. But in the first place we have to thank the Emperor Menelik, that intelligent ruler and restorer of an ancient and great empire, for his help and permission to pass through his country. In the second place our thanks are due

* Read at the Royal Geographical Society, June 9, 1902. Map, p. 480.

for the kind assistance afforded by Major (now Lieut.-Colonel) Harrington, H.B.M., Agent in Abyssinia, Major Ciccadicola, the Italian envoy, and Mr. Muhle, postmaster and chief engineer of the telegraph and telephone lines between Adis Abeba and Harar.

From Harar we made an excursion to the mountains of Gara Mulata, situated about three days to the south-west, and not visited by any European since the time of Captain Hunter. The western slopes of this range are covered with thick forest, and therefore the fauna, as well as the flora, here contrast sharply with that which we had found in the dry Somali desert between Zeila and Jildesa, situated at the foot of the Harar mountains. Returning to Harar, the first thing we found was a prohibition to continue our journey to the south, as the countries of the Ennia and Arussi Galla were said to be in a state of rebellion, excited by that of the Somal; and only after a solemn declaration on our part to the effect that the Emperor Menelik should not be held responsible for our safety, and thanks to the great assistance of Major Harrington, did we receive permission to continue our journey. Unfortunately, we were again obliged to put off our departure, as a great many of our camels, which during our sojourn in Harar had been left at a place in the Erer valley, had died there from the results of eating poisonous herbs, and it was impossible to obtain new animals for some time. We therefore made a temporary camp at Gandakore, in the country of Argobba to the south of Harar.

It is remarkable that, in spite of their proximity to Harar, next to nothing was known of the interesting Argobba people and their old stone buildings. The remains of this probably once powerful nation dwell on the eastern slopes of the Hakim, a mountain ridge situated to the south of Harar. Their houses were built of stone, had high watch-towers in the centre, and were surrounded by strong walls; they are now mostly fallen into decay, and are only partly inhabited. The old ruins overlooking the Erer valley resemble mediæval castles, and present a picturesque appearance. Scattered amongst them are the straw huts of the Ala Galla, who form the greater part of the population of to-day. Mysterious reports as to the Argobba exist among the Harari and the Galla; it is said that at certain festivals they devour human flesh. It is certain that these reports are untrue, as the Argobba are strict, even fanatical Mohammedans, but they seem to prove that the nation is of quite a different origin to the inhabitants of Harar.

On May 22 we set off southwards from Gandakore, and on the next day we passed the village of Biaworaba. The Austrian explorer Paulitschke had pushed as far as this place in the year 1884, but since that time no European had reached it or explored further south, as the Abyssinian Government had strictly forbidden any European to enter that country. South of Biaworaba we entered the country of the Ennia. This people is a mixed race of Galla and Somal; they speak a Galla

dialect, but have followed the nomadic manner of living of the Somal. For one or two years they build for themselves square huts of cow-dung, much resembling those I found, during my journey in East Africa, in use by the sedentary Masai, the so-called Wakwafi. Besides these, they build for their cows and sheep peculiar huts, 7 to 8 feet high, resembling a sugar-loaf, likewise of cow-dung. Sometimes, but seldom, they cultivate small tracts of land. These people are rather poor, and they are therefore mostly left in peace by the Abyssinians. At the time of our visit they were in extremely poor circumstances, as different parties of the Ogaden Somal had crossed the river Erer some months before, and had carried off many of their cattle. On the whole,

BASALT ROCKS NEAR LASMAN, BRITISH SOMALILAND.

the country is a high plateau, thickly grown with bush and intersected by two tributaries of the Wabbi, the Gobele, and the Moyo, which have cut deep cañon-like clefts in the tableland. On the banks of the Moyo we found some beautiful grottoes, and I must also mention the remains of some old towns which we passed during this part of the journey. Here was formerly situated the Ethiopian frontier province of Daroli, which was devastated in the year 1528 by Mohammed Granye, the Sultan of Tajura, the "Attila of Africa," as he has been called. I must also note, at this point, that the river Shenon, marked on former maps, was not to be found, and was not even known by name to the Eonia people. And further, we discovered at several places between Harar and the Wabbi—especially near Harrorufa and Achabo—

strata of Jurassic age containing numerous fossils mostly in a splendid condition. On June 10 we were able to cross the river called Wabbi by the Galla, but better known by the Somali name Webi Shebeli, that is to say, the Leopard river.

On the further bank of the Wabbi an event occurred which might have proved fatal to the success of our expedition. Our Somal, or a great part of them, had made up their minds to strike, as they feared our expedition would keep them too long from home. Perhaps they intended to go straight east and to join the revolting Ogaden tribes. By good luck I arrived just in time to stop the party from crossing the river with their rifles. They were afraid to return without them, and so, after a day's consultation, they agreed to go farther west with us. We were now in the country of the Arussi, a large and once much-feared section of the Galla tribe. Near a place called Gurgura we struck the route of Dr. Donaldson Smith, the first explorer of these countries, and followed it as far as the holy Mohammedan town of Sheikh Husein. Here, on the southern banks of the Wabbi, the bush was not so dense as on the north, and game was in some places abundant. We often found the fresh tracks of elephants, and near a place called Luku there were large herds of zebra (*Equus grevyi*), oryx and "gerenuk" (*Lithocranius Sclateri*), and plenty of the lesser kudu. The town of Sheikh Husein is well known from the wonderful description given in Dr. Donaldson Smith's book. When you approach it, you already see from afar the white tombs of the sheikhs glistening in the sun. There are about twelve tombs altogether. In the middle there is a cemetery, containing the tomb of the Mohammedan saint who is said to have founded the town, and whose name it bears. The inhabitants tell many stories of the miracles he did: for instance, he is said to have piled up in one night a small mountain situated south-east of the town. The faces of the inhabitants show clearly that they are descended from old Arab colonists. Their chief is the Imam, a direct descendant of Sheikh Husein. The Christian Abyssinians, who for about ten or twelve years have been masters of these countries, treat the Mohammedans here, and their traditions, with much respect. Everything in and near Sheikh Husein is holy, and belongs to the dead Sheikh. It is not permitted to cut wood near the town, no cattle are sold, and we were asked not to shoot birds. One of my Somal having caught two bats with a butterfly net in the holy tomb, a large assembly was held, and the poor fellow and myself were cursed by the Imam, until I gave him some dollars to appease the wrath of the dead sheikh. I will simply mention that, besides the tombs, there are other stone buildings in Sheikh Husein, which, in my opinion, are perhaps of a pre-Islamatic origin, such as a wall about 2 feet thick surrounding a small lake near the town.

Prior to our arrival we had received messages from the Abyssinian dejasmach (General of the Centre), Wolde Gabriel, the governor of

these countries, ordering us, in the name of the Emperor Menelik, to proceed straight to Adis Abeba. Meanwhile, we had lost so many camels by the rough roads in the Ennia and Arussi lands, that we were compelled to leave here about half our stores. Directly west of Sheikh Husein there was no road practicable for camels, so we had to proceed two days in a south-westerly direction, crossing the beautiful and forest-clad chain which Dr. Donaldson Smith has called the Gillet mountains. The forests here show nothing of the character of a tropical African forest. Looking at the tall fir-like juniper trees, among which, in some places, the barley-fields of the Arussi are scattered, the traveller might imagine himself in the Black Forest

GROTTOES ON THE MOYO RIVER.

or in the forests of Tyrol. West of the Gillet mountains is an isolated mountain called Abunas, or Gara Daj, by the Arussi, which we ascended after some quarrels with the Abyssinian chief whom Wolde Gabriel had sent us as escort. This fellow seemed to be afraid that we might run away on the other side of the mountain. On the top of the Abunas there are ruins of a sanctum probably of pre-Islamitic age. The view here is splendid, and boundless on every side except the north, where Mount Abulkassim, about 900 feet higher than Abunas, is situated. From the summit we descended to the Wabbi, recrossed the river to the north, and camped about halfway up Mount Abulkassim, the holy mountain of the inhabitants of Sheikh Husein.

This mountain, already seen from a very far distance fifteen years

ago by the Italian explorer Ragazzi, had never before been visited by any European. There is a good way leading upwards to a high precipice, in which are about a dozen caverns, at some seasons of the year inhabited by Mohammedan pilgrims. In one of these we found a stool, a mortar with pestle, and a wooden pillow. Not far off is the grave of Sheikh Abulkassim, a descendant of Sheikh Husein, made in an artificial bower situated in a wonderful tropical forest full of lianas and palms. The grave is covered with glass beads and ornaments of copper and brass. Similar ornaments are also to be seen on some trees in the forest, and no visitor would dare touch these holy objects. Round the mountain there is no settlement whatever.

From Abulkassim, we proceeded west for about three days on the hills situated on the northern bank of the Wabbi. Near a place called Jaffa we were stopped by a large body of Abyssinians sent by the dejasmach Lulsagit, through whose countries we had now to pass. It took us some trouble to get permission to proceed farther, as the dejasmach had had no notice of our arrival. Here we had to ascend the last step of the plateau, and found ourselves on a large grass-covered expanse, absolutely flat and without any trees, called Didda by the inhabitants. On old maps this plain is called the Arussi plateau. The North-Western Arussi, who live here, are a pure Galla tribe, showing no mixture of Arab blood, as do the inhabitants of the Sheikh Husein district. The sight of these dirty, long-bearded men galloping their small ponies, covered with brass and iron rings, over the wide plain, reminds one of Mongolian or Tartar tribes, rather than of an African people. Their huts are scattered in small groups of three to five all over the plain. They do not cultivate much ground, but have large herds of fine cattle. Just as we arrived here the rainy season broke out with terrible vehemence, and the plain was soon changed into a large swamp, so that we here lost nearly half our camels. The crossing of this plain took us twelve days, after which we descended into the valley of the Hawash, which had overflowed its banks, and in some places changed the valley into a large lake. I will here mention the church Georgis, in the district Sire, which was formerly a Mohammedan mosque, but is now changed into a Christian church by the Abyssinians. It might have been supposed that the country between the Hawash and the Abyssinian capital was absolutely known, as many explorers, including the Italians Traversi and Ragazzi and the German Stecker, had visited it. We were all the more surprised to find here a magnificent waterfall unknown before. The river Modsho, a small northern affluent of the Hawash, which is here about 500 feet broad, falls over a precipice 40 feet in height. We called this waterfall, which I consider to be one of the most beautiful in North-Eastern Africa, Menelik falls. Passing by Lake Buchoftu, one of a group of five small crater lakes called the Adda lakes, we arrived in Adis Abeba on August 14.

The Emperor Menelik promised us free permission to travel in his countries, and any assistance we might require. Owing to the fact that our journey from Zeila to Adis Abeba had taken us nearly double the time we had at first calculated, Baron Erlanger and I came to the conclusion that it was impossible for us to accomplish together all our proposed programme. We therefore decided to divide our caravan, in order to explore as large an extent of unknown ground as possible. Baron Erlanger proposed to return by another route to Sheikh Husein, and to strike thence to Lake Rudolf by a new route, while I made up my mind to first penetrate the highlands of Shoa proper, and afterwards to find a new route somewhere westward to the Sudan.

For the moment travelling was out of the question, it being the

MENELIK FALLS.

height of the rainy season; but as soon as the rain began to slacken, I formed a small caravan and started for that unknown part of Shoa which lies between the rivers Guder and Muger, two large southern affluents of the Blue Nile. Two days from Adis Abeba I passed the place Ejere, then a small village, but soon to become the new residence of the Emperor Menelik under the name of Adis Halem—that is to say, the "new world," the scarcity of wood near the old capital Adis Abeba ("new flower") becoming each year more and more apparent. Near Ejere, and still more in the district of Cheracha, there are magnificent large forests. After passing these I came to the district of Kollu, and stopped some days near a village called Aveve, as the place was noted

for the presence of lions. I found some fresh tracks, but did not get a chance of seeing one. Here I found the source of four small rivers not previously known, the Urga, Gora, Taranta, and Bussiyo, which afterwards unite under the name Taranta to form a rather large river, which then flows westward to the Guder. The Bussiyo forms the frontier between Kollu, belonging to Shoa proper and the province of Gindeberat, which belongs to Gojam, the land of the since deceased king Tekla Haimanot. I will here mention the interesting basalt mountain called Badattino, on the top of which there are a village and a church. From here to Abuye, an Abyssinian fort situated on the edge of the plateau, the country has the character of a beautiful English park. I had to leave the bulk of my caravan at Abuye, as the road thence down to the Blue Nile was not practicable for fully laden mules, and descended with only seven men and a small tent. The difference in height between Abuye and the Blue Nile is about 5800 feet. The river was now in flood and turbulent, making it quite impossible to cross to Gojam. Great heat prevailed in the valley, and we were terribly bitten by mosquitoes. I therefore gave quinine to all my men, and it was interesting to find that one who refused to take it, got an attack of malaria after six days. Having reascended the plateau, I returned by the same way to Badattino, and thence took another route straight eastwards.

Near a village called Adaberga, I arrived to witness the end of a religious ceremony of the Galla. The Galla are split up into some large divisions, and these again into smaller tribes, which are at the same time religious communities. Each of these tribes has its high priest, or Gallan, who resides near a sacred grove. On certain days of the year the Gallan shuts himself up in his house, and, after working himself into a state of ecstasy, makes inspired communications to the people standing round. The Christian Abyssinians are forbidden by their priests to attend these ceremonies; nevertheless, they believe in the mysterious power of the Gallan, whom they hold to be in league with the devil. The Gallan here was an interesting-looking man standing over 6 feet high, with long hair and beard. From Adaberga I went to Falle, a place given by the Emperor Menelik to Mr. Ilg, and here I stopped some days to observe and collect specimens of the black Jellada baboon, a species not previously met with, which lives on the rocks of the steep precipices leading to the Muger river. After four weeks' absence I returned to Adis Abeba, and now prepared for my expedition to the Sudan.

The route I chose did not lead directly westward, because the chain of lakes situated in the northern part of the great East African rift-valley seemed to offer some interesting geographical problems, as the existing maps on that part published by the Italians Traversi and Bòttego, by the Frenchman D'Aragon, by Donaldson Smith, by the late Captain Wellby, and a new one published by Count Leontieff,

which came into my hands just before starting from Adis Abeba, could not be brought into agreement with each other. By the different position assigned on these maps to the lakes situated between Lake Zwaĭ and the large Lake Abaya, called Lake Margarita by Bòttego, I calculated that there ought to be one or even two lakes in that region not yet known. This calculation was afterwards confirmed by the discovering of Lake Langanna or Korre and the double Lake Abasi.

I left Adis Abeba on November 14, and at Mount Zekwala met the caravan of Baron Erlanger, who had started some days previously. The Hawash was now so low that we easily marched through it. From here to Lake Zwaĭ the country is covered with typical acacia bush, in

FIRST VIEW OF THE BLUE NILE NEAR ABUYE.

the middle of which I found the grass and moss-covered ruins of an old Abyssinian settlement. Round Lake Zwaĭ, and on down the whole of the rift-valley, as far as I followed it, game was plentiful. On the hills and mountains bordering the valley we have the large kudu, while farther south, at Lake Abaya, there is the lesser kudu. We saw on the plains the East African zebra (*Equus granti*), hartebeest (*Bubalis swaynei*), and Grant's gazelle, in the forests elephants and rhinos. The reeds bordering the lakes are inhabited by large herds of water-buck and reed-buck.

The region near Lake Zwaĭ is very interesting from a geological point of view. We are here at the northern end of the great East African rift-valley, which extends south to the middle of German East

Africa, finishing near Mount Gurui. The mountains bordering the valley at this northern part consist mostly of obsidian and other volcanic vitrified rocks. Some smaller rocky hills standing out in some parts of the valley also consist of the same material. The river Suksuk joins Lake Zwaj with the more southernly situated Hora Shale. Lake Hora, as it was called by the late Captain Wellby, is wrong, for Hora means "Salt Lake;" Hora Shale, "Pelican Salt Lake." South of it is the Hora Lamina, the water of which, as we were told by the Galla, has the same salty properties as has the Hora Shale. There is only a small neck of land between these two lakes, in the middle of which lies Mount Fike, a volcano of the typical horseshoe form, with its opening turned northwards. South-east of Lake Zwaj lies the Alutu, a mountain which consists in its upper parts almost entirely of a greenish-black obsidian-like rock. I made the ascent, and saw from the top, east of Hora Shale, a lake previously unknown, which was called by the Arussi who accompanied us Hora Langanna, or Hora Korre. This is the most beautiful of the lakes, as the southern slopes of Mount Alutu fall in picturesque contour into the water. There is a connection between this lake and Hora Shale, which is called Daka by the Arussi. I reached the Hora Korre on the next day; its waters are only slightly brackish. South of Hora Korre I found the most magnificent euphorbia forests I ever saw in Africa. Near a great market-place called Alelu I marched for about five or six hours, hardly seeing any other tree. Arriving at Lake Abassi, which, although seen by d'Aragon, is not to be found on any recent map, probably because it was considered identical with the Lake Lamina of Captain Wellby's, my caravan and that of Baron Erlanger were stopped by the Balambaras Abite, a sub-chief of the Dejasmach Balcha, the Abyssinian governor of these countries. In spite of the permission given in the Emperor Menelik's letters, we had to send messengers ahead to the dejasmach, in order to ask his permission to come to his residence. It took them five days to return. I used that time in making investigations of the hot springs, which are situated at the eastern corner of the lake. Some of these had formed hills of tuff 10 feet high. The substance is about the same as that of the Karlsbad-Sprudelstein. The hot water bubbles out at the summit.

Here we entered a new ethnological region, that of the Sidamo people. The Sidamo form one group, with the Jamjam, Walamo, Borodda, Kosha and Malo people on the banks of the Omo river. This is a group of a probably very remote origin, but more or less mixed with conquering Galla tribes. Ascending from the north, we had to pass wonderful forests covering the western slopes of a high mountain chain, till we reached the plateau covered with alpine marsh and bamboo forest, on which Abera, the "Katama," or residence of the Dejasmach Balcha, is situated. Abera lies about 10,000 feet above the

sea-level, and is three hours north of the old capital Daressa, visited by D'Arragon. Looking northward, one has good views back as far as Lake Abassi; looking westward, you have glorious views of Lake Abaya or Margarita, with the mountainous countries of Walamo, Borodda and Gamo on its western shore.

The reception the dejasmach had prepared for us was most magnificent. Hundreds of horsemen dressed picturesquely came out to meet us. Between our camp and the bamboo palace of the dejasmach there was a double line of Abyssinian warriors in full attire, dressed with silk skirts interwoven with gold or silver, or covered with lion and leopard skins. Hundreds of shields, covered with gold and silver ornaments, glistened in

THE SUKSUK RIVER.

the sun. The dejasmach wished us to continue our journey by the great Abyssinian road running south along the ridge of this large mountain chain, but I intended to descend to Lake Abaya, in order to have some shooting, and to visit one of the large islands in the lake. It was long before the dejasmach would give permission for this. He told us dreadful stories of the bad roads, the absence of food near the lake, and the number of people killed by lions there. The reason for these stories probably was that he was afraid that we would shoot too many elephants, of which we afterwards found large herds on the shore of the lake. Descending, I passed the country of the Gudji, or Uata Dera, who in their physiognomy reminded me very much of the Wandorobo tribe of East Africa.

Quite a different population called Gidicho lives on the largest island of the lake. The Gidicho have good-looking, Somali-like faces. My Somal found, to their great astonishment, that a great part of the Gidicho expressions were almost identical with their own, as, for instance, the words for the various parts of the body and for the best-known animals, such as lion and leopard. I consider this discovery to be of great importance from an ethnological point of view, as the Somal were always thought to be the last intruders in North-East Africa, and here we find an isolated tribe surrounded by a population of an apparently older origin. The boats of the Gidicho are very interesting. They are rather rafts in boat form, being made of the very light wood of a species of ambach. The bow is often ornamented like that of the Venetian gondolas. Formerly there were constant quarrels and wars between the inhabitants of the islands and those of the shore, but now, under Abyssinian rule, all live in peace with each other.

At Lake Abaya my caravan separated from that of Baron Erlanger, who had to return to Abera and Sheikh Husein. South of Lake Abaya lies Lake Ganjule, whose water has a wonderful dark azure blue colour, and may be compared to the most beautiful lakes of Switzerland. I had resolved to pass along the eastern shore of Lake Ganjule, in order to solve the problem of the sources of the river Sagan, the largest affluent of Lake Stefanie, which was supposed to flow out of Lake Ganjule. This I found to be not the case. The sources of the Sagan lie east of the south end of Lake Abaya. But there is a broad channel connecting Lake Ganjule with the Sagan. The bed of this channel was dry at the time, but there were some large and small water-pools scattered over it. When the water rises in Lake Ganjule for about 5 inches, which will probably take place every year at the beginning of the rainy season, a large river will run from Lake Ganjule to the Sagan. On the upper Sagan I again found some hot sulphurous springs. It was impossible to follow the course of the Sagan, as it runs at some places through densest forest, the haunt of rhinos and buffaloes, the tracks of which were to be seen everywhere. I went round the south corner of the lake and ascended the mountains of Gardulla, where I reached in the second week of January, 1901.

The Gardulla were the first people of Bantu stock that I met. The difference can be seen at first glance in their heavier and stronger built figures and their nearly black skin. Whilst working in the fields the men go quite naked; in the villages they wear skins and cotton stuffs. Cotton is the principal cultivation of Gardulla and of most countries northwards to Kosha and Konta, while further north Kaffa and Jimma are the first coffee-lands of Africa. As the hills of Gardulla are very stony, the inhabitants range the stones in terraces, so that a Gardulla hill has the aspect of a vineyard on the Rhine. They have their houses and the walls surrounding them made of broad, plain planks, and on

the top of the reed roof there is as ornament a red earthenware vase. The land was formerly under a queen, who still lives in a place called Gidole. The Abyssinians still allow her to exercise her authority in petty affairs, but she has no further influence whatever. The true ruler of the land, the Futarari Wolde, is a sub-chief of Futarari Afta Georgis, to whom the Emperor Menelik gave these countries when conquered, but who prefers to remain in Adis Abeba. The Gardulla wear broad necklaces of brass or copper. The women wear bracelets, necklets, and rings round fingers and toes, made of small red and blue beads. In Gardulla I saw the first camels since my departure from

BOAT OF THE GIDITSCHO, ON LAKE ABAYA.

Adis Abeba. Futarari Wolde has a large herd of these animals, obtained from the countries of the Borana and Tertale near Lake Stefanie, which are kept in a place at the foot of the mountains. Westward of Gardulla there is a large uninhabited plain, called by the Abyssinians, "Adoshebaï."

The spirit Adoshebaï of the Abyssinians combines the qualities of a devil and patron saint of the hunters. They call upon Adoshebaï when they have killed a lion, elephant, rhino, giraffe, or buffalo, and even a poor Shankala, that is to say, any of their large game. I may here mention that the Abyssinians call Shankala not only the tribe called Beni Shongul by the Arabs, living on the western banks of the river Dabus, but all the Sudanese and black people living in the countries round Lake Rudolf and near the Omo. That

is all dark-coloured people with the exception of the Somal and the Galla.

There is a legend that, when the Abyssinians conquered this country about seven years ago, two elephant-hunters were descending from the "Katama" Gardulla to the large plain to the west. They had the luck to kill one of the large pachyderms near a small hill, and called on their patron saint, when suddenly the hill began to dance and sing, "Adoshebaï, Adoshebaï." So they now look upon the plain as the home of this spirit. The Abyssinians had also told me of a dangerous disease, which would kill all our mules and horses, by which this plain is haunted. Nevertheless, I determined to cross it, as otherwise I should have had to follow hence, as far as the Omo, the route taken by Captain Bòttego. But I marched straight on without spending much time in hunting the game, which was abundant here. Elephants, rhinos, buffaloes, large herds of zebras and hartebeests of a species new to science, were seen. In the night we were disturbed by the roaring of the lion.

After two days' marching we came to a river called Shambala by the Abyssinians of our escort. On the other side we saw natives running away from their cotton-fields in terrible fright. We were here in the country of the Male, which may be identical with the Mela mentioned by Donaldson Smith. The Male are not yet absolutely subjected by the Abyssinians. I gave presents to some old men and women, who were not quick enough to run away, and sent them back to their fellows, but I was not able to have any intercourse with the people, as the next day nobody appeared. Here I found, for the first time, bows and poisoned arrows, while in all the countries passed before the spear and sword were the only arms. Crossing the Barsa, another river flowing, like the Shambala, into Lake Stefanie, we came to Uba, a part of the equatorial province given by the Emperor Menelik to the Abyssinian count and dejasmach Leontieff. There is a good fort in Uba, built by the brothers Seljan, now officers of Count Leontieff, formerly musicians and professional pedestrians. Neither of the two brothers were here, as they were recalled to Adis Abeba by the emperor, on account of some differences they had had with the natives.

In Uba the illness which the Abyssinians had feared in the plain of Adoshebaï broke out amongst the mules. I had thought before that it might be the tsetse fly disease, but it now became clear that it was the glanders. This disease seems to be endemic on all the northern affluents of Lake Stefanie, as is shown by the experience of the late Captain Wellby, who lost most of his animals after passing the same region. I descended into the beautiful valley of the river Zenti, covered with thick forest and magnificent palm trees, which separates Uba from Gofa. The Zenti runs northward into the Omo.

Every day more of my mules and horses became afflicted with the

disease, and many of them died. The representative of Dejasmach Lamma, the Governor of Gofa, who was at the time in Adis Abeba, sent me native porters, who helped me to carry the baggage up the mountains of Gofa, which reach an altitude of about 10,000 feet above sea-level. At a place called Gadat, near the capital Jala, I stopped for two weeks, and, in order to master the disease, isolated the sick animals and divided the others into small bodies. After that time I had saved about twenty-five out of sixty. Meanwhile I had sent my Abyssinian headman with a small escort to Adis Abeba with orders to buy new mules and horses there, and to come back as quickly as possible to Anderacha, the capital of Kaffa, which I had designed to be my starting-point for the unknown

LANDSCAPE IN GARDULLA.

lands in the west. From Gofa to Kaffa the expedition went on very slowly, because I was now dependent on native porters, whom I got by order of the Abyssinian governors from the smaller native chiefs, and who had to be changed when we came into the land of another chief, which was always after one or two days' short march. Crossing the rather bare valley of the Ergino, another affluent of the Omo, I came to the country of Doko.

The Uba and the Gofa, through whose countries I had passed, until here belong to the Wallamo tribe. The Doko are typical Bantu, and seem to be nearly related to the Gardulla. The men walk about absolutely naked; the women wear an apron made of cut banana leaves. They know how to weave cotton stuffs well, but seldom use

them themselves. North of Doko is the country of Malo, inhabited by a Wallamo tribe. Hence I descended to the Omo, which I managed to cross within two days, on rafts resting on inflated goatskins. In this region there is not much forest on the shores of the river, as the banks consist of gigantic gneiss blocks. At no place in Africa have I seen so many hippos as here. Walking down the banks, I saw in half an hour more than a hundred heads appearing above the surface of the water. Every stony bank in the river was occupied by a family of these clumsy animals. They are not hunted here, and therefore not at all shy.

North of the river lies the country of Kosha. Kosha and the neighbouring Konta are the only provinces I found in Abyssinia where the slave-trade is in full swing. At the large weekly markets you can see —besides cotton, coffee, flour, goats, and sheep—children sold in small or large lots. It is probable that this trade is due to the great famine by which these countries have been stricken during the last two or three years, and the children all seem to be quite happy at becoming the property of richer men, with whom they will be better fed. The houses of the Kosha chiefs are very interesting. They are long barn-like structures, about 15 feet high and 50 to 60 feet long, entirely covered in with grass. Here the rainy season was ushered in by terrible tempests, and for the next two months we had thunderstorms nearly every day. Near a place called Dereta we passed the "Kella," or gate of Kaffa.

These South Ethiopian kingdoms Kaffa, Jimma, Gera, and Enarea, of which we have still but an imperfect knowledge from the journeys of the Italian Cecchi and the Frenchmen d'Abbadie and Borreli, are separated from each other by an interesting system of fortification. Where the countries are not bounded by high mountain chains, difficult to cross, they are surrounded by deep ditches and strong fences, which can only be passed by means of a guarded gate called the "Kella." The Abyssinians, after having taken these countries, retained this system of fortification and the custom duties between the different countries. The export of slaves is absolutely forbidden, that of cattle only allowed by permission of the governor. The whole south of Kaffa is one large forest; there is a broad road leading from the Kella to Anderacha, the new capital. It is absolutely impossible to penetrate the forest which borders the road without using axes or bush-knives. Scattered in clearings in the forest are the villages and coffee plantations of the inhabitants, the Kaficho. These are said to be the descendants of the old Ethiopians, who were isolated when Mohammed Granye, Sultan of Tajura, smashed the old Ethiopian empire in the years 1528–43. It is a fact that most of the Kaficho were Christians when the Emperor Menelik conquered Kaffa about five years ago. Also the "Gez," the ecclesiastical language of the Abyssinians, was still in use, but the language used by the Kaficho of to-day has no affinity whatever with the modern Abyssinian. Kaffa was formerly ruled by powerful

independent kings, to whom also nearly all the countries west of the Omo were subject. The last king, Savo Teheno, who had submitted some years ago to Menelik, revolted, was defeated by the Abyssinians, and brought as prisoner to the old Abyssinian capital Ankober, where he still lives. Kaffa and all the countries south of the Gojeb and west of the Omo were given to Ras Wolde Georgis, one of the favourites of Menelik. Kaffa was formerly the principal coffee-producing land in Africa, but when the Abyssinians took the country, many of the plantations were destroyed, and it is now inferior in that respect to the kingdom of Jimma. The national dress of the Kaficho formerly consisted of long capes of reed, grass, or hemp. The men wear hats made of goat and

MARKET IN DOKO.

colobus monkey skins; the women conical hats of bast. These national costumes are now seldom seen in Kaffa, where the inhabitants dress like the Abyssinians, but they are still exclusively used in the tributary land of Gimirra in the west.

My headman reached Anderacha ten days after my arrival, and brought with him some new men and some mules; but now my most terrible time began. Nearly all the Abyssinians, and also my thirteen Somal, struck and refused to proceed to the unknown countries westward, where, they said, they would all be killed. They went to the Abyssinian chiefs, swearing that they had only been engaged up to Kaffa. The small Abyssinian chiefs (Ras Wolde Georgis and his chief officials being in Adis Abeba at the time) sympathized with my men,

as, in spite of the Emperor's permission, they were afraid to let a European go out of the country. Much patience, much money, and many promises were needed to persuade my Somal and about half of my Abyssinians to remain with me. As I was, therefore, in want of new men and also new mules and horses, I had to make an excursion to Jimma, adjoining Kaffa on the north-east, and separated from it by the river Gojeb, an affluent of the Omo. Approaching the Northern Kella of Kaffa, I found everywhere evidences of the last war with the Abyssinians. Near the road I saw strong fences and deep ditches, while the forest was virtually honeycombed with holes about 10 to 12 feet deep, with a pointed stake in the middle of each.

Jimma is almost the richest land of Abyssinia; the inhabitants are pure, well-built Galla; they are nearly all Mohammedans, as well as their king, Aba Jifar, a very clever man, who at the right time submitted to Menelik, and therefore retained his country. King Aba Jifar, who helped the Abyssinians very much in conquering Kaffa, is now in great favour with the emperor. The capital of Jimma is Jiren, the most important market-place in Abyssinia. I estimate that the Thursday market in Jiren is visited by nearly twenty to thirty thousand persons. From all the countries bordering the river Omo, and even from Adis Abeba, and other lands in Southern Ethiopia, the Nagadis or Abyssinian merchants meet in Jiren to sell their wares. All the products of Southern Ethiopia are sold there, in many double rows of stalls about a third of a mile long.

Having enlisted twenty strong men and bought some dozens of mules and horses, I returned to Anderacha, and started thence in the first week of April. Gimirra, which we reached first, is a tributary land to Kaffa; the people seem to be Kaficho, perhaps with a mixture of Nilotic blood. Their old king Chotatu and some of his companions are nearly $6\frac{1}{2}$ feet high. They wear the national dress of Kaffa, already described. The men often wear necklaces, with a string of Hyrax teeth hanging down their chest. In Gimirra is the last Abyssinian post. The people of Binesho, which we passed next, are in friendly relations with the Abyssinians, who will probably soon take possession of the country; the people of Shekho, which lies west of Binesho, are only another branch of the Binesho, but are absolutely independent, and the land is often plundered by Abyssinian razzias.

The Binesho and the Shekho are of the Bantu stock, but are, perhaps, the most interesting tribes I ever met. Their language is hard and sharp sounding. Their figures are broad and muscular; they have different kinds of tattooing on the chest and on the back, but their most interesting tattooing is on the forehead, in which they cut vertical slits, which gives them the aspect of wearing a horn. They often wear capes made out of grass, like those of the Gimirra, and also capes made of cut bark, and, to my great astonishment, I also found clothes woven of

bark, similar to those worn in Uganda and Usoga. I never saw a woman, either in Shekho or in Binesho, probably because they are first placed in safety as the object most desired by the Abyssinians. I had to be very much on my guard here, as the Shekho were always lurking in the bushes, trying to cut off my men and kill them singly. Once they speared one of my horses while grazing, nevertheless I succeeded in avoiding any actual fighting.

In Shekho I found a large river running westwards. I believed this river to be the Gelo, discovered near its junction with the Ajuba by the Italian Bòttego, an opinion which was confirmed afterwards. Travelling became very difficult here. The western slopes of the South Ethiopian

OMO RIVER BETWEEN MALO AND KOSHA.

plateau are cut by many deep ravines; the roads therefore were narrow and bad, and many of my mules became wounded and useless. As it flows westwards, the river Gelo is lined on both sides by the densest forest. I could march only about 2 or 3 miles each day, and to cover that distance the men had mostly to cut the way with axes and bush knives from morning till noon, after which the caravan was able to proceed. The inhabitants of this forest are the Mashango, who were very seldom seen, but we often found large traps made for hippos and water-bucks, and loops made of creepers for monkeys and other small animals going to the water. Already in Gimirra I had seen, far away to the west, a long mountain chain running from north to south, called by the Galla "Gurafarda," that is to say, "horse's ear," from a sharp double peak

in the middle. It took more than three weeks from Gimirra to reach the point where the Gelo pierces the mountains, forming magnificent cascades. Some days after passing this gap, I saw from a bamboo-covered hill in the west a boundless bush and grass-covered dead flat, the plain of the Sobat and the beginning of the Sudan. Only a few granite hills are scattered over it. Ascending one of these, I saw, far away, a large lake—Lake Tata—through which the river Gelo runs. Here we found the first villages of the Jambo or Anyuak, who were the first true Nilotic people I met. They are a division of the great Shilluk tribe, which is spread over the whole Eastern Sudan, and extends southwards to the east shore of Lake Victoria. The few samples I obtained of their language show that it is scarcely distinguishable from that of the Kavirondo people on the east shores of Lake Victoria, whose country I passed on my first African journey in 1894.

The land now became more and more swampy. The Anyuak, poverty stricken through many Abyssinian razzias, live hidden away on small islands in these swamps. A large part of the people have migrated westward, and live in a state of semi-slavery under the protection of the more powerful Nuar near the Egyptian fort of Nasser on the Sobat. Approaching Lake Tata, the swamps became so numerous and deep that I turned south and marched to the Akobo or Ajuba, which river I reached near the village Gneum, where I struck Bòttego's route. The attempt to march along the northern bank of the Akobo failed, because we stuck fast in the swamps, where I lost many of my mules; so, after two days, I marched back to Gneum and crossed the Akobo. The country on the left shore of the river, which had here a north-westerly direction, was drier.

As at that time I had only the maps of Bòttego and Wellby, I concluded that the Akobo of Bòttego and the larger Ruzi of Wellby must be one and the same river. I therefore hoped to get from here to Nasser dryshod, but, instead of turning to the north as I expected, the course of the river after a few days took a due westerly direction, winding in and out over an immense grassy plain. I was now in a very bad plight; my cattle and flour had been a long time exhausted, the country was nearly uninhabited, and game, which had been plentiful on the first days on the river Akobo, became scarce. Glanders had broken out again, and every day more of my animals succumbed. Suddenly I reached the right bank of a slowly flowing river, full of crocodiles. It was now apparent to me that this was the Ruzi of Wellby, or, as it is called by the Nuar, the Pibor. It was impossible to cross the Pibor without boats. So I recrossed the smaller Akobo in the hope that, marching on the right bank of the Pibor, I might find villages with boats. My situation became now desperate; out of sixty-five animals with which I had left Gimirra, I had only thirteen mules, two horses, and two donkeys left.

All the stores not absolutely necessary were thrown into the river, the same was done with all the tents except my own, as well as with my books and clothes; the only part of my belongings which I contrived to bring safely home being my collections, photographs, diary, and route-books. The day after we had passed the Akobo, I had already dug a hole in which to hide an object which for the moment was only a useless weight—the tusks of an elephant I had shot in the Gurafarda mountains—and I was just looking round my tent to see what more I could dispense with, when suddenly a great tumult arose in the camp. I snatched up my rifle, as I thought an elephant or a giraffe had come near the camp, but my chief Somali jumped in crying,

PART OF JIREN MARKET (DJIMMA).

"Marka, Marka."* Abyssinians, Galla, and Somal were screaming, crying, dancing and firing their guns, all looking down the river. There was a steamer in sight, slowly approaching and filling nearly half the river-bed. The Egyptian flag was flying from the mast, and two Europeans stood at the bow. The steamer stopped alongside our camp, and I welcomed the first of the Europeans in English, but on hearing my name he answered me in pure German. It was Sir Rudolf Slatin, and the other gentleman Colonel Bluett, the Mudir of Fashoda. I went on board, and everything was soon explained. Slatin Pasha and Colonel Bluett had come on a journey of inspection to Fort Nasser, on the Sobat, and thence they had had to proceed to a village called Karadong, on the Pibor, in order to settle some quarrels between two

* "Steamer, Steamer."

influential Nuar chiefs. On arriving here they had heard that a European was approaching with a large caravan, and had decided to steam up the river in order to bring me assistance if required. They had found me when I was just at the last extremity. Had I come two or three days later I should have been forced to make my way to Nasser by land, which would have been a difficult task, considering the diseased state of my mules, and the probable hostility of the Nuar, who had formerly been robbed by the Abyssinian raiders. There are still the ruins of a large Abyssinian fort near the junction of the rivers Akobo and Pibor. As one of my Somal had the day before shot a large bull giraffe, and my men had therefore provisions for four days, Slatin Pasha was kind enough to take me on board, with all my men and my collections. The surviving mules were given to the Nuar of Karadong.

The next day the steamer passed the point where, on the map of this region published by Major Austin in the *Geographical Journal*, 1901, the river Gelo joins the Pibor, but it was apparent that the small river flowing in here could not bring all the waters of the mighty river along which I had marched for four weeks. The Gelo probably divides after having passed Lake Tata; the northern branch, which is possibly the largest, running northward to the Baro, and the southern again dividing into two rivers which flow to the Pibor.

Passing the small Egyptian fort Nasser and the famous Fashoda, one of the sorriest-looking places in Africa, we steamed down to Khartum. Broad green fertile plains alternated with acacia-covered scrub steppes. On the banks of the river we saw villages of the Nuar, the Dinka, and the Shilluk, with their large rounded huts. Everywhere we saw absolutely naked women and men, the latter mostly painted white, boisterously greeting the steamer. There were large herds of cattle, sheep, and goats, and in the Arab districts of the lower White Nile camels, horses, and donkeys. A picture of peace and plenty is the Egyptian Sudan of to-day. We arrived at Khartum on June 15, and I there enjoyed the charming hospitality of the Sirdar, Sir Reginald Wingate. Here, also, I had the pleasure of again seeing Captain Harold, who had given us much help in starting our caravan from Zeila eighteen months before. My Abyssinians were sent by steamer up the Blue Nile to Roseires, in order that they might return thence to Adis Abeba by way of Famaka. My thirteen Somal accompanied me to Cairo, and returned thence to Aden.

I will now give a short review of the purely scientific results of the journey.

From a geographical point of view, it was important to connect the southerly point of Paulitschke's route near Harar with that of Dr. Donaldson Smith, and, further, to bring these into connection with the surveys made by Traversi, Ragazzi, and Stecker in the south of Shoa.

The route I took from Adis Abeba to the Blue Nile passed through country which until then was a blank spot on the maps, as the chief roads from Adis Abeba to Gojam lead to the right of the Muger, or to the left of the Guder. The only map which had hitherto mentioned this district is Fritzsche's map of Dr. Stecker's journey in the Galla countries (*Petermanns Mitteilungen*, 1891), which marked this country as unexplored. Going from Adis Abeba to the south, I chose a route along the east side of the great rift-valley, as the principal road on the western side was already well enough known by the journeys of Captain Wellby and Mr. Harrison.

As I have already mentioned, this resolution was rewarded by the

SCHEKHO HUT.

very important elucidation of the lake system between Lake Zwaĭ and Lake Stefanie, and the discovery of the lake Langanna or Korre. Further, I ascertained that there is no lasting, but only a periodical connection between Ganjule and Stefanie lakes, as the Sagan is not a permanent effluent of Lake Ganjule.

After having carefully surveyed Kaffa and the neighbouring districts (the old maps of Cecchi and Borelli being very incorrect), I ascertained that the watershed between the Omo system and the source region of the Sobat—that is to say, the Nile system—lies on the frontier of Kaffa and Gimirra. The route which I here took lies almost in the middle between the routes of Captain Wellby and Captain Bòttego in the south and those of Bonchamps and Marchand in the north, and

leads through a district which until now has been a blank on the map. Of the source rivers of the Sobat, the most northerly, the Baro, is the largest, and must be reckoned as the real head-stream of the Sobat. Then come the Pibor and the Gelo. The Akobo or Ajuba, which, according to Bòttego's maps, was the principal source river of the Sobat, is, in comparison to the three first-named rivers, very insignificant, and is nothing more than a tributary of the Pibor.

As regards the ethnology, we have first the purely Hamitic tribes of the Somali to the north of Harar, and then, after passing the Semitic settlements of Harar and Argobba, the tribes of the Galla to the south. All the countries between Harar and Adis Abeba, as well as the parts of Shoa which I passed through, are inhabited by Galla tribes. The Abyssinians have merely taken possession of the country by subsequent conquest. We first find a purely Abyssinian population to the north of Ankober and in Gojam. In the territory of the lakes and near the Omo we find the interesting tribes of the Walamo and the Sidamo. We come next to the northern extension of the pure Bantu in the tribes of the Gardulla and the Doko; and further westward in the Shuro, the Binesho, and the Shekho. The Kaficho are said to be the descendants of the ancient Ethiopians, but it seems to me somewhat questionable whether they can be connected with the Abyssinians of to-day. After crossing the Gurafarda mountains, we find in the Jambo or Anyuak, and in the Nuar, peoples of pure Nilotic race, the first of which belong to the Shilluk, the second to the Dinka group. I succeeded in bringing with me rich ethnological collections, obtained especially amongst the people living in the lake-chain and the Omo districts, and have also collected specimens of the languages of about ten different tribes.

The geological survey was started south of Harar. I found in many places as far as the Wabbi, especially near Harro Rufa and Achabo, strata which, according to the numerous and mostly very beautifully preserved fossils they contain, must belong to the upper Jurassic formation. I found several ammonites, especially *Aspidoceras* and *Perisphinctes*; numerous fragments of a species of *Nautilus*, plenty of *Belemnites*, a great number of *Rhynchonella* and *Terebratula*, and many *Gastropods* and *Bivalves*, these last containing numerous species of *Ostrea*, *Exogyra*, *Pholadomya*, and *Pecten*; also plenty of *corals* and *spongia*.

The most important discovery was that of strata of Cretaceous age, which I found in the Gillet mountains south of Sheikh Husein and between Mount Abunas and the Wabbi. As is shown by the few but perfectly preserved fossils I found here, these strata belong to the Turonian. With these there are also in many places evidences of an eruptive period, which must have been at the beginning of the Cretaceous epoch.

The whole country, however, from Abulkassim and Abunas to the north-west and west, up to the Blue Nile on one side, and the sources of

the Sobat on the other, is formed for the most part of Tertiary volcanic rocks. I found strata of Jurassic age only once again, namely, in the neighbourhood of Badattino, in the province of Gindeberat.

The formation of the great East African rift-valley may also belong to the Tertiary period. The north of this valley was once filled up by a great lake-basin, whose remains may be seen in the numerous small lakes which we passed by on our way. I found a proof of it on the Suksuk river, where I discovered strata containing numerous remains of mollusca embedded in its banks 80 to 100 feet above the water-level of to-day. The species which I found here are the same which still exist in the lakes Langanna and Ganjule.

Descending to a height of about 3000 feet above the sea, the gneiss formation is to be found in several places, as on the Blue Nile and on the Omo. Associated with it, quartzite occurs in various places, which, because of the gold it contains, or is supposed to contain, has awakened a lively interest for these countries within the last few years.

I collected about seven hundred specimens of rocks and about two thousand of fossils.

I can say but little concerning the botany, as this fell to the province of Dr. Ellenbeck. After the break-up of the united expedition, I had to accomplish single-handed the work which had been before divided between five Europeans, and therefore had but little time to collect plants. I could only obtain some two hundred specimens; whilst between Zeila and Adis Abeba Dr. Ellenbeck had brought together a collection of some two thousand five hundred specimens.

The chief work of our expedition, besides the geographical survey, was directed to zoological researches and collections. During my journey I passed through five different zoological regions.

Firstly, the Northern Somaliland, which showed in its fauna, especially near the coast, strong signs of a palæarctic or better mediterranean influence. Among the mammals we found here were *Gazella pelzelni* and *speekei*, two species of the northern group of gazelles, and further a *Dipus*. Amongst the birds there was an *Aëdon* and a *Galerita*, and amongst the reptiles an *Uromastyx* and a *Tarantola*. Also the enormous number of the *Geckonidæ* and of genuine lizards from the genera *Eremias*, *Latastia*, and *Acanthodactylus* were also remarkable.

The fauna of the Galla countries to the south of Harar resembles that of the northern Somali countries, and contain many of the same forms, as especially the "Gerenuk" (*Lithocranius Sclateri*), but is entirely lacking in any palæarctic influence. Amongst the birds, I will especially mention here the rare *Galeopsar salvadorii*, which was seen in large flocks on the banks of the Wabbi. Both of these regions show very many characteristic kinds, which do not appear in any other faunistic region of Africa; but one must remember that some of the species occurring here reach about as far as the Pangan river in German East Africa.

From the tableland of Didda on to the north-west, we find the pure fauna of the Abyssinian highlands, of which we first gained a knowledge through the explorations of Eduard Ruppel. Amongst the mammals, I will name here *Canis simensis*, the Abyssinian giant fox, *Oreomys typus*, a peculiar rodent; the "Jellada" Baboon: and amongst the antelopes, *Sylvicapra abyssinica*, the "Abyssinian duyker;" and the "Fike" of the Abyssinians, *Urebia montana*. On the mountain ridge which divides the Hawash valley from that of the Webbi Shebeli, this Abyssinian fauna extends eastward as far as Harar. We had already found many Abyssinian birds on the Gara Mulata, such as *Agapornis taranta*, *Bostrychia carunculata*, *Turdus simensis* and *abyssinicus*, and numerous others. These are all forms which are entirely lacking in the Somali districts.

Near the lakes of the great rift-valley I found an intermixture of faunas. Many Somali forms appear here, in addition to purely Abyssinian species and others, which until now we have only known from German and from British East Africa.

Thus near Lake Zwaj, there appears a form of Grant's gazelle, and the zebra which occurs near Lake Abaya is not *Equus grevyi* (the zebra of Somali and Galla lands), but *Equus granti*, firstly described from Masailand. The *hartebeest* is the Somali form, *Bubalis swaynei*; the reed-buck is the Abyssinian, *Cervicapra bohor*. Also in the mountain forests of the Omo district I found chiefly Abyssinian forms, but with them forms which had previously been known only from the mountain woods of Mau and of Ruwenzori; among the birds, for example, *Pholidauges sharpii* and *Stilbopsar stuhlmanni*.

On the Omo another element appears in a great number of West African forms, such as *Oriolus auritus*, *Lamprocolius glaucovirens*, and especially *Agapornis pullaria*, the common West African dwarf parrot.

After passing the Gurafarda chain we find the pure lowland fauna of the Sudan, which is especially characterized by its antelopes—*Bubalis lelwel*, *Adenota mariæ* and *leucotis*.

The zoological collections of the expedition are the greatest which have ever come to Europe from Africa at one time. I was able to collect more than 1000 specimens of mammals, belonging to about 140 different species, 16 of which I have already described as new. The bird collection was in Baron Erlanger's province until the break-up of the united expedition. After our parting I was still able to collect 1300 specimens, which belong to 375 different species, 10 of which I have been also able to describe as new.

The whole collection of insects resulted in about 30,000 specimens, besides which 2000 mollusca were collected; and large collections of reptiles, fishes, crustacea, olygochætæ, and other small animals have been preserved in spirits.

I took about 600 photographs during the expedition.

The PRESIDENT: Mr. Oscar Neumann, who has been so good as to come here to communicate a paper to us, has made a very important journey from Somaliland to the Nile, and has gone over a country which is very little known to us, rather to the north of the tracks taken by recent travellers. The paper will be one of very great geographical importance. I will now request Mr. Neumann to read his paper.

After the reading of the paper the following discussion took place:—

Major AUSTIN: I rise with some diffidence, as I have only seen quite a small part of the country traversed by Mr. Neumann, but I saw quite enough to thoroughly understand the difficulties he experienced during the latter part of his journey. As he has told us, during the rainy season the whole of the valley of the Sobat is one vast swamp, and two years ago, when I first traversed that country, going from the Sudan to Abyssinia, I experienced the same difficulties as Mr. Neumann. On that occasion I lost over a hundred donkeys and all the mules and camels I started from Omdurman with. There is one point I think I don't quite agree with Mr. Neumann about, and that is regarding the Gelo. Like many rivers in this region, I dare say he noticed near their origin they appear to be very much larger than they do lower down, as they narrow considerably towards their mouth. For instance, the Gelo, where I first struck it, in the year 1900, was considerably larger; in fact, three or four times as broad as where I ultimately left it to cross to the Akobo. The depth of course was very much greater, but at the same time there were several overflow channels which, as Mr. Neumann suggested, flowed north and joined the river Bela shown on the map, but I think the main stream does really flow into the Pibor somewhat to the north of the 8th degree of latitude. I do not know whether Mr. Neumann took any observations where he last saw the river, but I was so much struck with that fact myself during our passage along the river, that I at one time could scarcely reconcile the fact that the Gelo, where we first saw it and where we saw it two or three days afterwards, was one and the same stream. I cannot say much more about Mr. Neumann's journey except to congratulate him most heartily on the great success he met with, and on having produced for the first time a map of the country, a large portion of which has never been sketched by Europeans. He has filled up a great blank in the map from the Abyssinian highlands across the plains to the Pibor. I congratulate you most heartily, Mr. Neumann, on your most successful journey.

Mr. RAVENSTEIN: It is a matter of some surprise that the only part of tropical Africa concerning which our information was most copious and trustworthy more than four hundred years ago should have remained, down to our own days, one of the most attractive and interesting fields for our modern explorers. Fra Mauro's Abyssinia carries us far to the south beyond the Hawash. The general correctness of his delineation is all the more surprising, as it is altogether based upon information derived from Abyssinian visitors in Venice. Indeed, so copious were the details furnished that the Venetian friar was induced to spread his information over the whole of Southern Africa, which would otherwise have remained a blank. Unfortunately for the friar's reputation as a scientific cartographer, whilst he thus unduly expanded his Abyssinia, he curtailed the east of Asia; for, although he knew better, he did not venture to fly in the face of the orthodox belief of his day, and delineated our Earth as a disc lying in the midst of a circumambiant ocean. Later mapmakers, whilst allowing Fra Mauro's Abyssinia to extend to the very extreme south of the continent, supplemented the authentic information obtained by him with what they found in Ptolemy or derived from the accounts of travellers, who, on the strength of the indulgences granted to all pilgrims to the Holy Land, came home with tales of the most marvellous kind. One of the most recent of these travellers was a German baron—not Baron Munchausen, but one Arnold von Harff—who, on

his return to Germany in 1493, claimed to have marched to the source of the Nile, and to have traced that river down to its mouth in the Mediterranean. Several of the names of places mentioned by him I have discovered in maps of the fifteenth century, but I have failed, hitherto, to trace this apocryphal geography to its original sources. Subsequently, in the course of the sixteenth and seventeenth centuries, Abyssinia became better known than are several of our African protectorates even at the present day, and the maps of Tellez and Ludolphus are surprisingly correct. Southern Abyssinia, however, remained almost a *terra incognita* to our own days. What had been done up to 1883 you will find fully exhibited on my map published by the Royal Geographical Society, where the researches of d'Abbadie, Léon des Avanchers, Cecchi, and others have been fully utilized. An immense amount of work has been done since. The east, south, and west of that mountain region have been skirted by Harrison, Wellby, Donaldson Smith, Cavendish, Bòttego, Major Austin, and others, but its interior is as yet hardly known to us. Kaffa, of course, has been visited frequently; Captain Bolatovich has crossed part of the territory granted to Count Leontief; and there have been several other explorers, who do not, however, appear to have done geographical work of the first order. For this reason Mr. Neumann's journey across this region from the lakes in the east to the Sobat river, is of the highest interest. This region, in fact, with its complicated valleys and numerous independent communities, is one of the most interesting parts of Africa yet to be explored. At present we know little more than its outline, and it is much to be wished that a member of this Society would concentrate his energies upon this region. I feel sure that the results which a conscientious and consistent explorer of that kind would bring home to us after a few years' labour would redound to his credit, and give him one of the foremost places amongst the explorers of Africa even at so late a period.

The PRESIDENT: We have listened this evening to a paper of unusual importance, for it has discovered to us countries which were almost entirely unknown. I particularly refer to that long chain of lakes to the south of Shoa, which, I think, used in former days rather to puzzle Mr. Ravenstein. Our visitor this evening, Mr. Neumann, has certainly discovered one of those lakes, and cleared up questions relating to five of the others. Indeed, I think it may be said that he has discovered five lakes. He has traversed what I consider to be the most interesting part of unknown Africa, that is, the mountainous country to the south of Abyssinia. The names of the provinces were known to us before, but very little more—Kaffa, Jimma, Gera, Enarea. I remember many years ago, when I was in the north of Abyssinia, that a small caravan actually arrived from Kaffa, led by a man who had collected Kaffa coffee intending to sell it; he had traversed the whole of Abyssinia with the greatest difficulty, and having to pay heavy tolls. I think it was a most wonderful instance of commercial enterprise. I had several conversations with him through our interpreter, Dr. Krapf. We wished him well, and he started to go to the coast. A few days afterwards we heard that his caravan had been robbed and that he had been murdered in the pass. So that gives you some idea of the extraordinary difficulty these people have in opening up communication with the civilized parts of the world. Now that the empire of Ethiopia may be said to be restored, it may be hoped that these commercial difficulties will gradually disappear. Kaffa, it appears, has fallen off in its product of coffee. I have had the pleasure of drinking Kaffa coffee, and it is the best I have ever tasted. We trust that these people south of Abyssinia, under the present rule, will have their prosperity restored to them. I think there can be very little doubt that in ancient times when the earlier empire of Ethiopia existed, that it extended quite to the foot of these mountains of Kaffa. Mr. Neumann has mentioned the name of Mohammed Gran,

an invader who broke up and destroyed and ravaged during many years the whole of that great empire of Ethiopia, and from that time it never recovered—not even in the days of Theodore—the whole of its dominion, until Menelik succeeded in actually restoring, I think to its ancient limits, the great empire of Ethiopia, from the rulers of which he claims to be descended. We all hope that under his rule the country will gradually recover its prosperity. These discoveries of Mr. Neumann are most important. You have heard from him of the great collections he made in natural history, and we have seen what an admirable series of photographs he has been able to take during his journey under great difficulties, and when I tell you that Mr. Neumann has been so kind as to come here from Berlin on purpose to read this paper to you and to communicate to you so much that is interesting, I feel sure you will pass a unanimous vote of thanks to him.

A TRIP UP THE KHOR FELUS, AND COUNTRY ON THE LEFT BANK OF SOBAT.

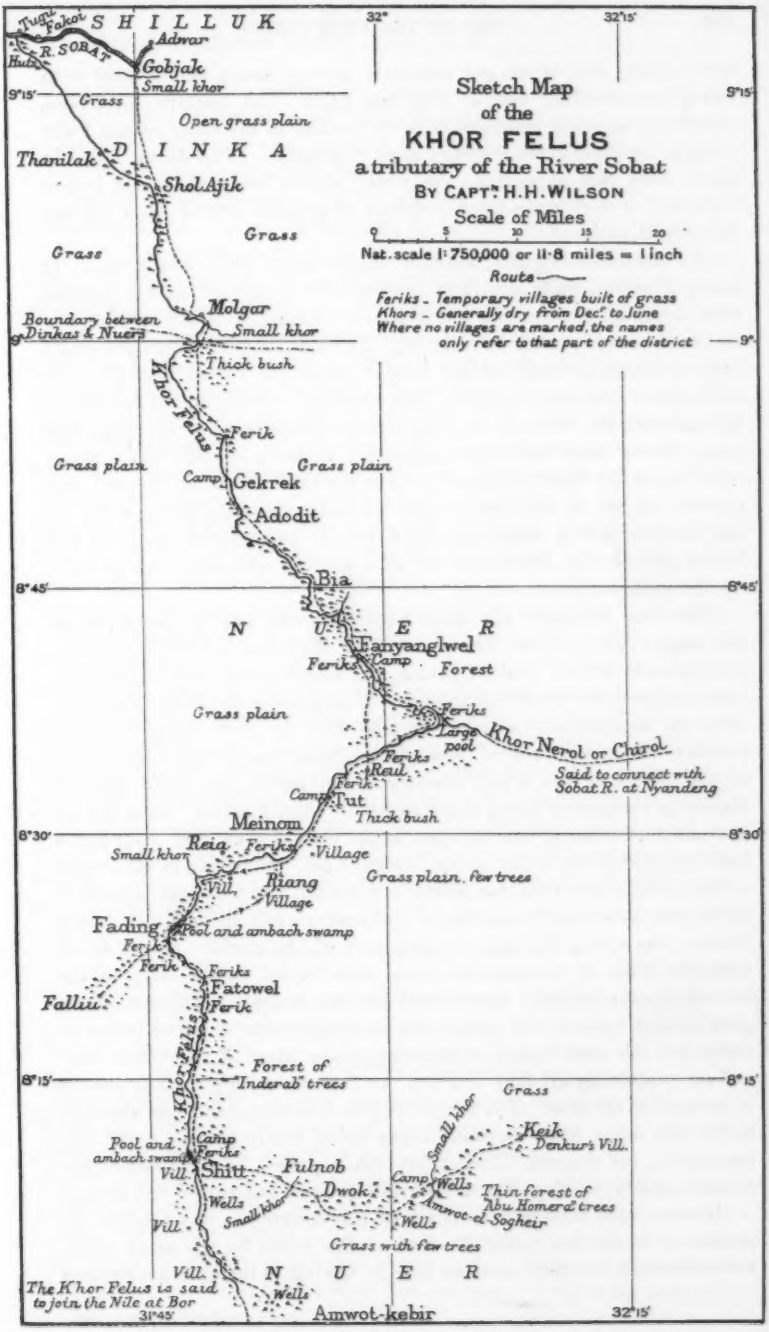
By Captain H. H. WILSON, Lancashire Fusiliers.

The large tract of land on the left bank of the Sobat river which is practically enclosed by the rivers Pibor, Sobat, Zeraf, and White Nile, is almost unknown; the only information regarding it has been supplied by local natives.

Owing to the extreme difficulty, if not impossibility, of an expedition making its way through this country during the rainy season, and until the long rank grass has been burnt and the soft ground hardened sufficiently for transport animals to move, it was not deemed advisable for the small expedition under notice to start before the beginning of April, 1902. The party consisted of 150 of the 10th Sudanese and Police, with twenty mules and thirty-five donkeys as transport.

Starting on April 15, the expedition marched from the village of Gobjak (some 20 miles from the mouth of the Sobat), and met the Khor Felus at Shol Ajik, some 8 miles inland, thus saving an unnecessary long march along the khor from its mouth, which is 10 miles from the Sobat mouth. The country here is flat and uninteresting, nothing but a vast grass plain, with hardly a tree to be seen. At Shol Ajik trees were met with, the banks of the khor being thinly wooded with a small growth of red talha, with a sprinkling of the unwelcome kitr thorn bush. The khor at this point is some 50 to 80 yards in width, mostly, however, filled up with weeds, the real water channel being clearly marked (though practically dry) by a deep narrow bed, some 15 feet lower than the adjacent banks. On to the village of Molgar the same country extends—grass, with a few trees; in one place there were traces of elephants which had been there in the rainy season. Other game seen was the bastard Tiang hartebeeste, which were really all the game seen in any quantity in the country. Molgar is a long scattered village on the right bank of the khor, and marks the limit of

the Dinka tribe inland. From here onwards for many miles is uninhabited country, from Bia to Nerol being thickly wooded, in places densely, but only occasionally with any undergrowth that makes travelling difficult. Tiang hartebeeste were seen in considerable numbers along the whole route, and also quantities of waterfowl, pelicans, duck, geese, teal, and many various kind of crane and heron. In the vicinity of Fanyanglwel the first signs of Nuer habitation were met with in the shape of their cattle feriks, which are the summer residences (*i.e.* dry season, from January to May), and are built close to water, constructed lightly of grass only. No regular huts or tukls were met with until Riul was reached, where the banks became low and flat, and trees only at some distance on either side. The khor is here in the rains evidently broad and shallow, and, owing to mud, probably an impassable obstacle under such conditions. A noticeable feature in the Nuer tukls is the superiority of their construction compared with the tukls of the Dinkas, Anuaks, and other tribes of the Sobat, their cattle tukls being in many cases marvels of constructive art, given only boughs of trees, grass, and native tools for their building. The regular solidly built villages are placed at varying distances from the khor, probably dependent on high ground, and on the nature of the soil, if suitable for the dhura crops or otherwise, which are always grown in the vicinity of the rainy season tukls. Another noticeable feature, differing from the Shilluk and Dinka customs, was that the villages are not compactly built. The Shilluks and Dinkas generally build their tukls in close proximity, each village being a thick cluster of huts, the dhura being sown anywhere in the vicinity. In the Nuer case the tukls are built in twos and threes, at great intervals, probably each family being separate; the land around each homestead being sown and tilled by the dwellers therein. In the case of many Nuer villages, owing to the village being built in the woods, and the groups of tukls at intervals of 200 to 600 yards, it was impossible to estimate the size of the village without covering many square miles of country. Around the various large pools of water near Meinom, Fading, and Shitt, were thick fringes of Ambach; these pools being the chief source of supply for men and cattle in the dry season, it is only natural to have found the water so churned up and fouled by the cattle as to be nearly undrinkable. In places near these pools, where the adjacent soil was sandy, wells had been dug to obtain a cleaner supply of water. From Shitt the khor continues in a southerly direction, being broad and shallow, and it is said, runs on to Bor. The expedition left the khor at Shitt, and, relying on native assurances that water would be found in wells, pushed inland, and marched through the main Nuer villages, which were in places very thickly dotted about, and well built. The country from Shitt to the limit of the march was well wooded, chiefly with the Heglik tree. The ground


Sketch Map
of the
KHOR FELUS
a tributary of the River Sobat
By Capt.n H.H. Wilson
Scale of Miles
0 5 10 15 20
Nat. scale 1:750,000 or 11·8 miles = 1 inch
Routes
Feriks - Temporary villages built of grass
Khors - Generally dry from Dec.r to June
Where no villages are marked, the names only refer to that part of the district
SHILLUK
DINKA
NUER
R. SOBAT
Tugi
Fakot
Adwar
Gobjak
Small khor
Grass
Open grass plain
Thanilak
Shol Ajik
Molgar
Boundary between Dinkas & Nuers
Small khor
Thick bush
Khor Felus
Ferik
Grass plain
Camp
Gekrek
Adodit
Bia
Fanyanglwel
Forest
Large pool
Khor Nerol or Chirol
Said to connect with Sobat R. at Nyandeng
Reul
Tut
Meinom
Thick bush
Reia
Village
Small khor
Grass plain, few trees
Riang
Fading
Pool and ambach swamp
Fatowel
Fallii
Forest of Inderab trees
Pool and ambach swamp
Shitt
Fulnob
Dwok
Wells
Thin forest of Abu Homera trees
Amwot-el-Sogheir
Grass with few trees
Keik
Denkur's Vill.
The Khor Felus is said to join the Nile at Bor
Amwot-kebir
32°
32°15'
9°15'
9°
8°45'
8°30'
8°15'
31°45'

rose slightly, and as one got inland it became sandy and covered with fine grass, standing two to four feet high. The country also, here, struck one as being presumably fairly healthy in the rainy season, there being a complete absence of any rank vegetation. The dhura crops in April were just appearing, the young shoots being about six inches high, and a very considerable extent of ground around each village under cultivation.

At Amwot-el-Sogheir, another fairly large khor was crossed, it being, however, quite dry, and the expedition camped on the further side, alongside some wells, which it was learned were the only ones to be found in this part of the district. These wells were worth noticing: dug on the sandy banks of the khor, their depth varied from 20 to 30 feet, with a diameter of about 2 feet 6 inches. Owing to the solidity of the ground, the walls of the well stood without need of reveting, and great labour must have been expended in their construction. Steps were cut in the walls on opposite sides, to enable a man to descend and ascend. In one of the wells a calf was seen, standing in the water at the bottom, having evidently fallen in. It was rescued by one of the Dinka guides, who descended the well without difficulty, and brought up the animal unhurt.

The total eclipse of the moon (April 22) was seen to perfection at the camp; the natives being asked if they could account for the phenomenon, stated that of course the Government was angry with some one, and had darkened the moon to emphasize the fact! From the camp an expedition was made on the 22nd to Nuer villages in this vicinity, which were stated to be the headquarters of the chief sheikh of the Nuers of the whole country under notice, by name Denkur. Marching through a fairly thick forest of "Abu Homera" trees for an hour, and afterwards over an open grass plain for another hour and a half, brought us up to the above village, Keik. Standing in the centre of the village, and seen for about 3 miles off, was a conical mound of earth, well and solidly constructed by Denkur's people, as a token that Denkur was a very big man in that part of the world. It was stated that the bones of innumerable oxen were buried in the body of the mound, the cattle being slaughtered for the occasion. This act was to give greater value to the cone in the eyes of the surrounding tribes, as cattle are the most valued possessions of the tribes of the White Nile, and are practically all they live for. In fact, what religion they possess is centred in the cow. The height of this conical mound was about 50 to 60 feet, many large elephant tusks being firmly planted round the base and on the summit. The largest tusk measured 7 feet 10 inches, but of poor quality, as long exposure to rain and sun had ruined the ivory.

Having thus traversed as much of this country as was possible, on account of water, the party returned to the Sobat by the same route, and arrived on the river-bank on May 2. Owing to the extreme shyness

of the Nuers, it was difficult to collect much information of their customs. Like all tribes at the Sobat, they are stark naked, and owing to their living in their own country, unmolested and out of all possibility of being in touch with civilization, it is only natural that they are sunk in barbarism and retain to the full all the inherited customs of their savage ancestors. Their hair is left to grow to a length of about 10 inches, and stained red with the ammonia contained in the dung and water of their cattle. Their bodies (of the men) are covered with the white ash of burnt cow-dung, like the Dinka tribe. This results from the men always sleeping in separate tukls, the floor of which is several inches deep with this white ash, resulting from the perpetually burning or smouldering fire of cow dung inside the tukl; the men actually make their bed in the ashes. The women do not thus cover themselves, but sleep on mats made of dressed cow-hide, and keep their own skins oiled and clean. The young unmarried girls, like the men, wear no covering, but the married women wear a loin cloth of whatever material is available, a leopard, gazelle, or sheep skin. The arms of the men consist entirely of spears (throwing) and shields, with the universal knob-kerry; bows and arrows are possessed by a very few—rifles they have none. It was reported that one of the big sheikhs possessed himself of a few at one time, but broke them up and made bracelets for his ladies. As I have mentioned above, the main wealth of the Nuers lies in their cattle and flocks of sheep. As the importance or otherwise of a man is gauged entirely by the number of his cattle, it follows that the quickest way to become powerful is for an individual, or a village, to appropriate the cattle of another individual or village, or better still of another tribe, and little raids of this kind are not infrequent.

At Nerol another khor joins Khor Felus, by name Khor Nerol, or Chirol, which is said to connect with the village of Nyandeng, on the Sobat. Owing to lack of water, it was found impracticable to explore any distance up this khor.

THE WINTER EXPEDITION OF THE "ANTARCTIC" TO SOUTH GEORGIA.

By Dr. J. GUNNAR ANDERSSON.

It is already known that the *Antarctic* returned to Port Stanley on March 26 from its first summer campaign in the Dirk Gerritsz archipelago, where a winter station was erected on Louis Philippe land. The leader of the expedition, Dr. Otto Nordenskjöld, who remained in the winter station, ordered the *Antarctic* in the winter season (April—September) to visit South Georgia, the Falkland islands, and Tierra del Fuego, to investigate the natural history of the regions mentioned. The scientific staff of the *Antarctic* for the work were the

following: Mr. J. G. Andersson, geologist, acting scientific leader of the expedition—joined the *Antarctic* in Port Stanley on March 29; Mr. S. A. Duse, for topographical, meteorological, and oceanographical work; Mr. A. Ohlin and Mr. K. A. Andersson, zoologists; Mr. C. Skottsberg, botanist.

On April 11 the *Antarctic* left the Falkland islands and anchored in Cumberland bay, in South Georgia, on the 22nd of the same month. The route was almost in a straight line, and oceanographical work was carried out to a considerable extent. In this part of the ocean not a single sounding had been taken before, and amongst the six soundings taken here by the *Antarctic*, the following are the most important:—

Lat.	Long.	Depth in fathoms.
52° 7′ S.	55° 40′ W.	777
52° 47′ S.	51° 36′ W.	1558
53° 6′ S.	48° 71′ W.	1985
53° 43′ S.	40° 57′ W.	1848

The last of these soundings is the most interesting, as showing that there is a deep sea between the Shag rocks and South Georgia, but no submarine ridge connecting them.

During April 27–30 the expedition visited Royal bay in order to inspect the present condition of the German station of 1882–83. The dwelling-house was found to be in good condition, the observatories being partly blown down. Mount Krokisius was climbed by Mr. Skottsberg, in order to look for the thermometers left there by the German scientists; but the thermometers were broken, possibly thrown over by wind. The termination of the Ross glacier descending into Royal bay was examined several times by the German Expedition, and it was stated that in the year August, 1882—August, 1883, the face of the glacier had retreated 2500–3000 feet. Evidently this regression was only of a temporary nature; according to the determination made in April, 1902, by Mr. Duse, the face of the glacier has readvanced beyond the maximum stage observed by the German Expedition.

On May 1 a party, consisting of Mr. J. G. Andersson, Mr. Duse, Mr. Skottsburg, and one of the crew, was put on shore to work on land during two weeks, the *Antarctic* at the mean time visiting the Bay of Isles, Possession bay, and a bay situated south-east from Possession bay, and slightly marked, but not named, in the British Admiralty chart.

On May 12 the *Antarctic* returned to Cumberland bay, and on the following day both parties were reunited. For a month (May 14—June 14) the ship was anchored in a safe harbour in the interior of the southern branch of Cumberland bay, going out occasionally for a day in order to sound and dredge in the bay. During the first part of this time (May 14–26) the weather was splendid, and the ground almost free from snow, the land-survey making good progress. In the last two weeks violent gales were experienced, covering the land with snow to a depth of about 3 feet.

The result of our stay in Cumberland bay is a detailed investigation of that part of South Georgia. The whole bay and its surroundings, an area of 250 to 300 square miles, was mapped on the scale 1 : 100,000, some parts of higher geological interest having been surveyed on the double scale. Of the excellent harbour already mentioned, a survey on the scale 1 : 10,000, with numerous soundings, was made. In the bay forty soundings were taken, indicating that the greatest depths are 137 to 170 fathoms, and that there is in front of the bay a coast-bank with a depth of 97 to 98 fathoms.

The geological survey gives evidence of a distinct plication in this region, the axis of the fold being nearly parallel to the longitudinal axis of South Georgia. In a rock in this folded formation was found a fossil, a *bivalve*, not yet determined.

The glacial phenomena are magnificently developed in Cumberland bay. We found here traces of two glaciations—an older, almost total, and probably filling the whole bay out to the coast-bank; and a second, more recent, of much less extension, but marked by terminal and lateral moraines of gigantic dimensions. (A fuller report on this subject will be published in the next number of *Ymer*, the journal of the Swedish Geographical Society.)

During the voyage to South Georgia twenty-five dredgings were made in depths reaching to 170 fathoms, most of these being taken in Cumberland bay. Here we made rich and varied collections of a fauna luxuriant both in species and individuals. Skins, skeletons, and embryos of sea-leopards and sea-elephants were collected.

The botanical investigations, though carried out in winter-time, have added to the phanerogamic flora two forms new to the island, besides the thirteen species previously known. Moreover, there have been made considerable collections of lower land-plants, and of marine algæ from depths to 55 fathoms.

On June 15 the *Antarctic* left South Georgia, returning in a wide curve to the north up to 48° 27′ S., and re-entered Port Stanley, July 4. During the homeward voyage seven soundings were taken, two of them indicating considerable depths in the hitherto unknown area north-west from South Georgia.

Lat.	Long.	Depth in fathoms.
50° 58′ S.	38° 54′ W.	2572 *
48° 27′ S.	42° 36′ W.	3279

Deep-sea temperatures and samples have been taken in nine series in all between the Falkland islands and South Georgia, but the material is not yet examined.

The principal interest during the voyage from South Georgia was

* 2572 fathoms being a minimum, as it is doubtful if the bottom was reached by this sounding.

attached to the deep-sea plankton. Hauls with large nets (10·5 and 3 feet diameter), from 1000 to 1500 fathoms depth gave rich collections of bathyplanktonic animals—fishes, medusæ, crustaceans, etc.

It is remarkable that no antarctic icebergs were seen during the whole expedition to South Georgia.

Port Stanley, on board the *Antarctic*, July, 1902.

THE SHORE OF DEMERARA AND ESSEQUIBO, BRITISH GUIANA.

By FRANK J. GRAY.

THE shore of Demerara and Essequibo consists principally of "sling mud" with small deposits of "caddy" and broken shell above high-water mark. The only exceptions to this are the sandy shores which lie in front of Golden Fleece and other plantations adjoining the mouths of the rivers. The subsoil is the clay of the country. The "sling mud"

SEA DEFENCES AT PLANTATION HOPE, DEMERARA.

is a non-calcareous plastic clay, similar in composition to the subsoil, but containing an excess of sand. It appears to be derived from the subsoil clay by the process of erosion and attrition by the waves, and by the addition of the sand of the "caddy" held in suspension by the sea.

The "caddy" consists of fine sand, mixed with clay and calcareous

matter. It differs essentially in composition from the "sling mud," and therefore is not of the same origin. It appears to be derived by erosion from the subsoil of the land immediately adjacent to the shore.

SEA DEFENCES AT PLANTATION HOPE, DEMERARA.

ENCROACHING SEA AT PLANTATION CULLEN, ESSEQUIBO.

The sand of the Golden Fleece and other shores which adjoin the rivers, is much coarser than the "caddy" sand. It appears to be derived from the material brought down by the rivers, for it is identical with the material deposited on their banks. It is noticeable that the river Essequibo spreads clear fresh water over the surface of the sea for a radius of about 2 miles.

The following are analyses of the principal shore materials:—

Dried Sample of Subsoil Clay.

Insoluble residue (sand)	27·05
Silica (SiO_2)	31·12
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	28·77
Lime (CaO)	0·11
Magnesia (MgO)	1·66
Combined water, organic matter and loss	11·29
	100·00

Sample of Sling Mud.

Insoluble residue (sand)	48·68
Silica (SiO_2)	11·74
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	27·44
Lime (CaO)	*nil*
Magnesia (MgO)	1·88
Combined water, organic matter and loss	10·26
	100·00

Sample of Caddy.

Insoluble residue (sand)	68 12
Silica (SiO_2)	5·95
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	12·34
Lime (CaO)	5·07
Magnesia (MgO)	1·18
Carbonic anhydride (CO_2)	3·67
Combined water, organic matter and loss	3·67
	100·00

The normal wave-action of the sea and the velocity of the tidal currents are very slight; but at times they acquire a force sufficient to move the extremely light mud in large masses, and thus to denude the shore in places. Where this occurs, the sea dams are liable to be undermined and breached.

The sea dams are clay embankments, built for the purpose of preventing inundation by the sea. To prevent abrasion they are, in some cases, faced with bush faggots, held down by spars; in other cases they are defended from the wash of the waves by a fascine breastwork. Wherever practicable a wide belt of courida bush and trees is left seaward of the dam. Breakwaters, either of bushwork or of pell-mell blocks of stone, are also resorted to. But all these devices appear to be ineffectual as methods of permanent protection, and their maintenance is found to be very costly. On this account, Messrs. Case &

Gray, of Westminster, were called in to report for the Colonial Government and the principal landowners in 1890.

It should be mentioned that along part of the sea-front of Golden

THE SHORE OF PLANTATION GOLDEN FLEECE, ESSEQUIBO.

Fleece, where the sea does not encroach, the full of the shore has been planted with sedge grass to prevent the sand from being blown away, and to preserve the natural barrier against the wash of the waves at high tides.

SOME GEOGRAPHICAL PROBLEMS.*

By Colonel Sir T. H. HOLDICH, C.B., K.C.I.E., V.P.R.G.S.

The Progress of Geographical Knowledge.—With so large a field as that which is embraced by geography before us, I feel a little doubtful which way to turn in order to gather into one short space both the scattered records of recent geographical history and to present to you at the same time illustrations of some fixed principle which, in the course of the development of our geographical knowledge, must govern the progress of it. Last year you heard from Dr. Mill a most excellent summary of the present phase of that development in this country. You heard not only of great activity in the wide world of the unexplored and unknown, but of new efforts to train up a fresh generation of explorers; of new schools springing up amongst us; fresh evidence of the faith that is in us that geographical knowledge points the road to commercial success; happy intimations of the existence of a yet higher

* Presidential Address to the Geographical Section at the Belfast Meeting of the British Association for the Advancement of Science, September 11, 1902.

faith—the faith which believes that scientific knowledge of the world's physiology is worth the getting for its own sake, whether it paves the way to golden success or not. And now, whilst recalling the chief geographical events of the year that has passed; whilst counting the landmarks on the road to a higher geographical education, I would also claim your attention for a brief space to a few technical problems which beset the business aspect of future procedure, and which, so long as we make it our boast that we belong to the biggest empire in the world, ought most certainly to attract our earnest attention.

The unknown world is growing daily smaller. It is, indeed, narrowing its area with a rapidity which is absolutely regrettable. If you think of those delightful days when men who went "down to the sea in ships" brought gold and ivory to the steps of Solomon's Temple, believing that beyond their nautical ken all the rest of the world was but flat emptiness; or even centuries later when Marco Polo's truthful tales of Asia were discredited as wild fables; or again in almost modern times when Vasco de Gama bent his knees in pious prayer ere starting on the buccaneering venture which was to change the destinies of the East, you will find it almost impossible to look at the well-turned-out maps of to-day, wondering where next it may be possible to strike a new feature or unfold a new vista to geographical enterprise, without something like a sigh. But it is with the world as we find it mapped to-day that we have now to do, searching out the position of such blank spaces as still exist, and considering the best means of dealing with the vast area of its half-exploited surface so as to obtain the best results for the time spent on completing our knowledge of it.

Antarctic Prospects.—To the Polar regions we naturally turn first, for they form the special domain of modern initial exploration. We are very far yet from having elucidated the great geographical problems of sea and land distribution which lie hidden under the depths of palæocrystal ice. We only know indeed from inference that at one end of the world there exists an unmapped sea, and at the other an unmapped continent, round the edges of which we are even now feeling our way. When the *Discovery* left the New Zealand port of Lyttelton on December 24 last for the South Polar regions, this was the quest which, in the modest language of her originator, Sir Clements Markham, lay before her: "to determine as far as possible the nature and extent of the South Polar lands," and to "conduct a magnetic survey." If we look at the unexplored area of these South Polar lands as a whole, and examine the plan of international geographical campaign which has now been directed against them, we shall find, I think, that the present enterprise is by far the most complete and systematic, as it is the most scientific, that has yet been undertaken in the Far South. It is impossible but that great results should be attained from so complete an investment of the unknown continent.

With the *Discovery's* investigations, which will be directed to Victoria Land—the land of the historic volcanoes Erebus and Terror—from the side of Tasmania and New Zealand, will be associated at least three other expeditions, all aiming at a final solution of the South Pole problem. From South America Otto Nordenskiöld's expedition has taken the shortest sea route past the South Shetlands to Graham's Land, and has already passed a winter amidst the ice. From South America, again, the Scottish Expedition under Bruce will work its way past the Sandwich islands, skirting the antarctic circle, some fifty degrees to the east of Nordenskiöld, almost on the Greenwich meridian, and as nearly opposite as possible to the *Discovery's* attack from the other side of the pole; whilst between the two will be the German Expedition of the *Gauss*, pushing southward about the meridian of 90° E., a worthy rival in scientific equipment to our own ship the *Discovery*. And there is no branch of scientific inquiry which will be advanced

by this international attack on the great unknown southern land of more interest than that which pertains to the history of the world's geography. Independently of securing a firmer outline to the vague definition of southern land areas of the present day, it is there that we hope to find evidences of another distribution of those areas in primeval times. Shall we be able to trace the Patagonian formations, those recent basaltic lavas which overlie trees, beyond that point in Graham's Land where we know that they occur again, to the Australian side of the Southern Pole? Shall we find that Erebus and Terror are but the natural extension of that magnificent array of volcanic cones which overlook the Pacific from the Patagonian Andes? Will the Miolania, the great turtle of Patagonia—not unknown in Australia—complete with his bones another link in that chain of many evidences that Patagonia and Australia once met across the extreme south? You may say this is not geography. I hardly know whether in these days it is still necessary to plead that between geography and natural sciences, whether of geology, biology, or anthropology, the connection is so intimate that in the actual field of research it is impossible to disconnect them. Modern geography is but a development, and whilst the process of its evolution is perhaps to be found in strictly geological fields, it has so modified and influenced the problems of life and the distribution of it throughout the world that a collector of facts like myself finds it convenient to accept, for the mere sake of simplicity, the science of geography as the best basis for divergent inquiries into many other scientific fields, which can be differentiated at leisure by the natural philosopher.

Necessity for Study of Geographical History.—But whilst we are justified in expecting much from this great international movement we must still moderate our expectations. We must admit that in the field of purely naval exploration we have not the same developments in mechanical and instrumental accessories which place within our reach the possibility of conducting land expeditions on far more scientific and exact methods than were possible to our grandfathers. Wireless telegraphy, for instance, will not yet enable a ship fast bound in arctic ice to determine her longitude, and the restless ocean still precludes the use of many of the more finely graduated instruments which are essential to the exact measurements pertaining to triangulation. Methods and instruments, indeed, will not differ materially from those adopted by Franklin or by Ross more than half a century ago. Better instruments of their class are no doubt within reach, owing to the extraordinary accuracy of modern production; but better hands to hold them it would be impossible to find. We are often so pleased with ourselves in these days that we are apt to forget what has been done by our geographical forerunners in the same field as ourselves. I have but lately returned from a journey full of geographical interest which has carried me over some of the tracks left many years ago by a British scientific expedition to the South seas, which will be ever associated in the memory of all geographers with the names of Charles Darwin and H.M.S. *Beagle*. With the wider scope for gathering information which is afforded in these days by the growth of civilization and the shooting out of its long tendrils into the waste places of Patagonia, it has been possible to verify some of the suggestions as to the structure and geographical configuration of that southern continent which were offered by the observations of Darwin, and to examine here and there, in some detail, the results of recent local surveys in testing the accuracy of the coast outline and of the coast soundings established by the *Beagle*. Of the former I can only say that they seem to me prophetic; of the latter, so little change has taken place in South American coast configuration during the last fifty years that practically the charts of the *Beagle* are the charts of the Chilian and Argentine admiralties of to-day, with hardly a noticeable variation. Such magnificent results

as were achieved then are hard to beat at any time. We do not hope to beat them. We can only hope to imitate them. They stand good for all time, and it is useful to recall them now and then in order to emphasize a truism which is occasionally overlooked by modern geographical explorers. It is not the most recent work in the field of exploration which is necessarily the most valuable. One of the great sins of omission in modern exploration is that of a failure to appreciate the efforts of preceding geographers in the same field of research as ourselves—the want of a patient absorption of all available previous knowledge before we attempt to add to the sum of it. We are not all of us gifted with the patient determination of that great traveller Sven Hedin, who spent three years in reading about Central Asia before he wrote a word on the subject. It cannot be too strongly urged in these days of narrowing fields for activity that, although geographical research is essentially an active function of an active life, it demands yet more and more, as time goes on, the application of the scholar added to the determined energy of the explorer.

Contraction of the World's "Terra Incognita."—It is, however, when we leave the high seas with their almost inexhaustible store of unexplored ocean floors and icebound coast-line, and turn from oceanography to the more familiar aspects of land geography that we find those spaces within which "pioneer" exploration can be usefully carried to be so rapidly contracting year by year as to force upon our attention the necessity for adapting our methods for a progressive system of world-wide map-making, not only to the requirements of abstract science, but to the utilitarian demands of commercial and political enterprise.

Asia.—Take Asia, for example: nearly half of the great continent pertains to Siberia, and within the limits of Russian territory the admirable organization of her own system of geographical exploration leaves no room for outsiders to assist usefully, even if political objections did not exist. In Central and Southern Arabia there is undoubtedly still much to learn, but of the remaining countries which intervene between the Mediterranean and India, of Persia, Afghanistan, and Baluchistan, it can only be said that the work of the geographical pioneer has already ended where that of the engineer and surveyor has commenced. In the Furthest East again—in Manchuria, China, Tonkin, and Siam—there is much more room for the practical exploration of the road and railway maker than there is for the irresponsible career of the geographical traveller. The highway from China to India is almost as well known as that from London to India, and the activity of railway enterprise in the south of Asia bids fair to rival the triumphs of Siberia. It is only in the central deserts of Mongolia and the wastes of Tibet spreading southwards to the Himalayas that we can find untrodden areas of any great magnitude, and even in Central Asia before venturing on a statement of future possibilities in the field of exploration, it would be well to wait for the records of that most intrepid traveller, Sven Hedin, who promises us material of scientific and historical interest as the result of his last three years' travel far in excess of the monumental contributions which he has already made public. Historically the interest of the world of inquiry in Asia, where we find the origin of the great races of the world and the birthplace of all religions, must always be immense; but that history can only be elucidated by a clear illustration of the great highways of the Continent which were open to the vast migratory movements of mankind in prehistoric periods. We do not in the least understand the condition of climate, nor are we quite certain even of the relative distribution of land and water in High Asia in the days when its swarming population first began to flow south and west, carrying the elements of a language which we have been accustomed to regard as primeval into the swamps and plains which lay beyond the Himalayas or the Caspian. It

is only through geographical research that some dim outline of those early stories can be realized; and although the researches of Stein and the marvellous discoveries of Sven Hedin around the ancient lake district of Lob Nor will, after all, only throw the world's history back for a few centuries, it is by means of these first steps backward that we can feel our way to an appreciation of the earlier processes of this phase of human evolution. Nor in the interests of utilitarian commercial speculation is geographical research in Asia yet to be set aside. We indeed know comparatively nothing of its resources in mineral wealth. It is quite within the bounds of possibility that one of the great central treasure houses of nature lies enveloped in the geological axis of the highest mountains of the world, and that we may yet be enabled to explain why every river which flows from Tibet washes down gold in its bed. But this will only be when the Tibetan lama is prepared to shake hands with the Uitlander; and I fear that recent South African history will not encourage the embrace. Meanwhile there is no more promising field still open to the *bonâ fide* explorer than that of Tibet and the farthest ranges of the Himalayas. Few people are aware how vast an extent of the Himalayan area still remains untrodden by any European. This is due to no want of enterprise on the part of our Indian surveyors and political officials. It is due partly to physical inaccessibility, and partly to that intense (and easily understood) objection to the interference of the stranger in which many of our transfrontier neighbours permit themselves to indulge. Nevertheless would I commend to those who still desire to walk in the rough and thorny path of pioneer geographical discovery a similar enterprise to that of our aforetime secretary, Mr. Douglas Freshfield, who lately succeeded in passing beyond the bounds of official exploration into the Eastern Himalayas. We have had many travellers in the Himalayas, but they have not always distinguished between the fascinating pleasures of romantic adventure and the earnest pursuit of geographical business.

Study of Glaciers.—To Mr. Freshfield we certainly owe an introduction to a new vista of great scientific interest in the study of the formation and movements of glaciers. Here, perhaps, we are treading gently on the skirts of geological science; but I have never yet found that part of the world where the careful study of local geographical conformation will not inevitably invoke an inquiry into geological construction. We must accept the inevitable criticism and go on with our glaciers. Where in the world can there be such an area for research into the conditions of glacial formations as is presented by the Himalayas? I grant the physical and political difficulties in the way to which I have referred, but still well within the limits of our own red border there are glaciers yet to be studied, which, if not the largest, are yet large enough to satisfy the loftiest aspirations, and beyond that border the difficulties of approach are lessening day by day, and are no longer so formidable that they need hinder the steps of any determined explorer.

South American Glaciers.—The speculative interest in glacial movements and their influence on the geographical conformation become far greater when one moves in a country which has been recently shaped and polished, grooved and fashioned, by glacial action; when huge blocks of granite or porphyry, standing sentinel over terraces and ancient glacier-beds, witness to the passing of icebergs in prehistoric seas. Such conditions one may find in two widely separated areas—viz. in the Pamirs and in Patagonia. What causes led to the formation of the first vast ice-cap of which the glacier is the latest evidence? what caused its disappearance, its reappearance? why are the glaciers again withdrawing from the mountains? and what causes the universal process of modern desiccation, of which there is such ample evidence in the Pamirs, in Baluchistan, in Patagonia? It is to the Himalayas that we turn first for an answer to this question; but there are

other fields almost equally promising, and one of them is to be found in South America. No one now can pretend any longer that we know nothing of Patagonia. Probably no country in the world has been described by so many geographers in so many different ways; there, at any rate, is a land of glaciers and snowfields awaiting research which presents few of the physical difficulties of the Himalayas. Here is a wonderful country truly, where glaciers reach down to the sea in low latitudes, casting little icebergs into waters fringed by green banks of fuchsia and myrtle, and of bamboo; where the laurel grows into magnificent timber, competing with the Patagonian beech for root-hold on the moss-covered soil. The round grey heads of the granite hills, scratched and seamed by a discarded ice-cap on one side of the narrow straits balance the snow-bound peaks of the Cordilleras on the other. No physical difficulties bar the way to the investigation of glacial phenomena amidst some of the most striking coast scenery in the world. Near the parallel of 51° S. are two Patagonian lakes closely associated—Argentina and Viedma—which offer opportunities for the study of glaciers such as are probably not to be found anywhere else in the same latitude. For here the phenomenon of disappearance is in the stage of natural illustration. Glaciers are disappearing rapidly which but a few years ago seemed to be a permanent feature of the surrounding mountains, and the lake surface is chequered with their *débris*. There, too, may be studied for hundreds of miles northward the natural sequences of their disappearance—the formation of freshwater lakes and their gradual desiccation in turn—whilst all around there is the continued story of geographical evolution due to the alternate forces of glacial and volcanic action written in gigantic characters on the face of nature.

Central South America.—Not very much has been added of late years to our practical knowledge of the hidden depths of Central South America, except from the inexhaustible mine of information possessed by that eminent geographer Colonel Church. A Brazilian expedition in 1890; the explorations of a commission sent to investigate the interior with a view to the establishment of new political capital to Brazil in 1892–93; the discoveries of Dr. Ramon Paz in 1894, and a chequered journey in the valley of the Orinoco by Stanley Paterson in 1897, form the principal records of modern days. There is doubtless much which is of the greatest commercial and political interest still to unravel in connection with the geography of the great river-basins of the continent. But in South America we are threatened with perhaps the greatest development of what I may call artificial geography that the world has ever seen. Not only will the consummation of the Panama canal project change the whole system of our Western sea communications, and probably exercise a more enduring effect on the world's commerce than even the Suez connection between East and West, but the possibilities of linking up by a central canal system the three great river-basins of the South—that of the Orinoco, the Amazon, and the Plata—is under serious consideration, and the mere project will in itself lead to an exhaustive examination of much untravelled country. Thus, even South America no longer offers a large field for the geographical pioneer of the future. With its narrowing areas of *terra incognita* and its almost phenomenal advance towards a leading position as the pastoral and meat-producing quarter of the habitable globe; with possibilities of development in this particular line probably exceeding those of Australia, New Zealand, and South Africa all put together, it is surely high time that South America turned her attention towards a combined and sustained international effort to place her scattered and most insufficient geographical surveys on a sound geodetic basis extending through the whole continent.

North America.—In the geographical fields presented by North America, as

also by Australia, magnificent as are the opportunities for acquiring that personal acquaintance with the great depositions of nature which environ new conditions of life, and shape the course of human existence to its appointed ends, or, in other words, to acquire a geographical education from original sources of instruction, there is but little opening for the enterprise of the pioneer who aspires to show the way into new fields. There is no lack of native enterprise in colonies peopled by the stout-hearted descendants of generations of explorers. Neither Canadians nor Australians wait for England to show them how to develop the resources of their own country, or pilot the road to new ventures. On the contrary, we have to turn to Canada now for instruction in the higher art of geographical map-making, and to admit that England has been left far behind in the development of the special branch of science which deals with the illustration of the main features of geographical configuration in relation to their geological construction.

Africa.—In Africa the advance of our knowledge of the main outline of the geographical features of the continent has been so rapid since the days when the Nile was first traced to its source by Spoke that a perfect network of explorers' lines of travel now embraces the continent in its meshes, and it is only in the intermediate spaces that room for enterprise on the part of the pioneer is left, even if it may not be said altogether to have vanished. A reference to the little map published by Mr. Ravenstein in the *Geographical Journal* for last December will show you at once that the hydrography of Africa has been fairly well traced out in all its main arteries, leaving but few unexplored spaces of any great extent; and that such spaces, where they occur within the area which is especially open to Englishmen, demand an organized system of exploration more complete in its results, more carefully balanced in its relation to the geographical illustration of those lands which are beginning to form centres of civilization than can be secured by the process of pioneer route-making. In short, we want a system of geographical surveying allied to those systems which have been perfected after years of careful experiment by Canada, or Russia, or France, or by England in India. This, however, brings us into a field of technical inquiry of great importance, into which, so far as it deals with geography, *i.e.* with the measurement of the Earth's surface and the illustration of its configuration by means of maps, I propose to enter briefly in this Address.

Modern Requirements in Geographical Map-making.—You will agree with me that geography in the abstract, without illustration—the geography which used to be taught by geography books without maps—is but a poor and inefficient branch of academic knowledge, hardly worthy even of an infant school. It does not matter what branch of this comprehensive science you approach, whether it is historical, or physical, or political, modern or ancient, the only substantial presentment of the subject to man's understanding is that which has recourse to map illustration. Words (especially words bearing such indefinite applications as our modern geographical terminology) can never convey to the imagination the same substantial illustration as maps convey to the eye. You may think that all this is mere truism; so it may be; but I assure you that what I may call descriptive geography, that is to say, geography without the aid of maps, has more than once nearly precipitated national disaster in quite modern times—disaster quite as perilous as any which in military fields has been caused by blank, wholesale ignorance of the features of a country in which strategic movements are undertaken. There comes a time in the history of every developing country when the increase of its people, and the consequent distribution of land, demands surveys for the purposes of fiscal administration. Consequently such surveys are common everywhere; and from these have been built up, piece by piece, like a child's puzzle, the

geographical maps of many half-occupied lands, illustrating only such portions as are adaptable to economic development, and leaving blank all that promised to be unproductive and unprofitable.

Field of Geodesy.—It was only when it was discovered that the sum total of such a production was apt to cause great confusion in land assessment, inasmuch as it often did not equal the actual area of the land distributed, that there arose a school of mathematicians who concerned themselves with determining the dimensions and figures of the Earth, and founded that apparently complicated system of primary map-making which now takes count of such matters as the curvature of the Earth's surface, the convergency of meridians, and other spheroidal problems which affect the construction of the map. Thus arose "geodesy," and geodesy has numbered amongst its apostles many of the greatest mathematicians of the age. Geodesy, the science which deals with exact measurements, was never an embodiment of abstract mathematical investigation. It had always a utilitarian side to it, and it is unfortunate that this view of the science has been occasionally lost sight of in late years. For we have not done with geodetic investigation yet. Magnificent as are the results obtained by the mathematicians of the past, there are still further refinements to be introduced into those factors which we daily use for the reduction of our terrestrial observations ere we obtain perfect mathematical exactness (if we ever attain it) in our results; and we still must look to the processes of geodesy to give us that backbone, that main axis of indisputable values from which our network of triangulations may spread during the first steps in geographical map-making. To a certain extent, geodesy is the support of technical geography, and a short inquiry into its present conditions of existence may not be out of place.

It is to North America that we must now turn for instruction in the latest development of the science, and to South Africa that we must look for its future application. Russia has not lost sight of the necessity imposed on her for an extension of her magnificent European geodetic system through the vast breadth of her Asiatic possessions, but we ourselves in India are concerned nowadays rather with scientific observations on collateral lines, and with the collating and perfecting of the results attained by the great achievements of past years, than with any developments in fresh fields of geodetic triangulation. Germany and France, ever alert where colonial interests are concerned, are busy in Africa, but I am not prepared to say how far their geographical interests are based on the strict principles of geodesy.

In North America, along the meridian of 98° through Texas, Kansas, and Nebraska, geodetic triangulation still forms one of the most prominent schemes of modern work undertaken by the Coast and Geodetic survey; and in South Africa there is growing northward into the Transvaal slowly, but we hope surely, the framework of a gigantic arc which one day will be extended by Sir David Gill from the Cape to Cairo.

I am anxious to impress on you that the science of geodesy is not a science of the past. It is still active, and with all its refinements of minute accuracy and exact precision in observation and in calculation, it should be the initial mainstay, and it must be the final court of appeal, as it were, for all those less rigorously conducted surveys of the reconnaissance and exploration class which we term geographical.

But this accurate framework, this rigorously exact line of precise values which ultimately becomes the backbone of an otherwise invertebrate survey anatomy, is painfully slow in its progress, and it is usually haunted by the bogey of finance. It does not appeal to the imagination like an antarctic expedition, although it

may lead to far more solid results, and it generally has to sue *in forma pauperis* to Government for its support.

Geographical Surveys.—And thus it happens that long before the tedious and expensive processes which are involved in the term "geodetic triangulation" can possibly be carried to an effective end, the cry goes up for a geographical survey. It is wanted by the administrator, to whom it is all-important that he should know the roads and river communications, and the productive areas of the land he has to administer, and be able to locate the various tribal sections or peoples with whom he has to deal. In the political department a geographical map may be said to be absolutely necessary for the political purpose of defining limits and boundaries. It has been, I am aware, occasionally dispensed with, but never with satisfactory results. To the officer on whom rests the responsibility of preserving peace and good order it is most desirable that the military features should be fairly represented in such a manner that at least a general plan of action can be arranged at short notice. For the economic development of the country it cannot be too strongly urged that a general geographical outline of its surface is indispensable to the selection of lines for special technical examination, whether for roads, railways, canals, or telegraphs. How often lately in the history of our colonial or frontier progress have vast sums been expended on special lines of railway in ignorance of the fact that better alignments of infinitely less physical difficulty would have been at once revealed by a general geographical map even on the smallest scale? In short, the cheapest, the quickest, the surest, indeed the only satisfactory method of regulating the progression of public works, the development of commerce, the proper recognition of the frontier boundaries, the administration of justice, and the military control of a large and growing colony, or of a long stretch of military frontier, is to be armed with a perfect summary of what that country contains in the shape of a geographical map; and yet it is only quite lately that this fact has been recognized by English administrators and English generals in their dealings with new colonies and new frontiers. Russia learnt the lesson a generation ago at least. When she reached out a hand for Constantinople, her army was accompanied across the Balkans by whole companies of surveyors, who worked on no sketchy system of indicating lines of route here and there. They pushed at least seven series of triangulation across the mountains, and on that as a basis they mapped the whole country in detail on a good military scale (about an inch per mile) right up to the very gates of the Turkish capital. For years her brigade of topographers has been busy along her Afghan and Siberian frontiers. In Persia, Baluchistan, the Pamirs, and China, wherever in fact there may be in the future some prospective view of a closer political, commercial, or military interest than exists at present, there they are to be found. France has always been strong in the geographical field, and the late achievements of Frenchmen in the world of exploration and of exploratory map-making are only equalled by the scientific knowledge and literary ability displayed in their technical literature on the subject. Colonel Laussedat's contribution to the 'History of Topography' is to be reckoned with as a standard work. In Canada and North America we have perhaps a practical exposition of the art of geographical surveying which is as unequalled in completeness and comprehensiveness as the country with which it has to deal is unequalled as a subject for its application. There the close association between geological structure and geographical conformation is so fully recognized that the same technical process of surveying is applied for the purpose of the double illustration. The Canadian geological survey is their geographical survey, and I think that it is to Canada (if not to India) that we owe the first recognition of the fact that geographical surveying is a separate, distinct, and most important

branch of the general art, which should form the basis—the mother survey, as it were—from which all other surveys should spring. In India I am happy to think that this advance in the science of geography is now well understood. It has been more or less forced on us by the necessity for such rapid and comprehensive surveys as are required for frontier military operations, for the purposes of boundary demarcation, and for the important duty of keeping our own trans-frontier information up to the level of that of our neighbours. In our African colonies it has, alas! been discovered a little too late that geographical surveys are a sound preliminary to military operations, but, the discovery once made, it is not likely to be overlooked. Here, indeed, was presented a most forcible illustration of the danger of building up a geographical puzzle map; of piling one on to another the results of local fiscal surveys in the hope that when they were all put together they might make a good topographical guide to the country. Needless to say, the result was disastrous from the scientific point of view, and it might almost be said of it that it was disastrous from the military point of view as well. Imagine for an instant that the Canadian system of a geological survey (involving, of course, accurate topography) had been applied *ab initio* to South Africa; who can possibly say what the result might not have been by this time? The expansion of the Randt mines, for example, depends at present on local experiment carried out no doubt by most able engineers with all the knowledge of scientific mining that is to be acquired in these days of advanced specialism. But all the same I may be permitted to suggest that their experimental ventures, their tentative borings, are subject to a good deal that is almost guesswork for their application, and that a comprehensive, carefully conducted geological survey of the whole country would probably have afforded valuable indications in many unexpected directions. So also as regards schemes for local irrigation. Take the north-western part of Cape Colony, for instance, the district known as the Karoo, where the best military map existing at the time of the war did not even pretend to show the main roads through the country. The stage of development at which that part of the colony has arrived in the all-important matter of local irrigation is only worthy of the Dark Ages. It would be laughed at in Persia or Afghanistan. The Arabs of mediæval times were experts in the art of the conservancy and distribution of water in dry lands compared to the modern South African (or South American) farmer. Now, I do not say that schemes for merely local irrigation require geographical maps to support them—such schemes only require a little enterprise, a little common sense, and a little capital—but I do say that the geographical map would long ago have revealed the opportunity for comprehensive schemes, such as exist in India, just as it would have pointed out the best alignment for roads and railways, the best means for dealing with an enemy who can move 50 miles in a night, and who can make, not merely a few square miles, but a whole district the theatre of his operations. What was wanted (and is still wanted) in South Africa is what is wanted in every part of the continent subject to British suzerainty. I know that I am but echoing the urgent demand which has been made by every commissioner and governor within the limits of that vast area—not for elaborate or special maps for fiscal and revenue purposes, all of which will come in due time, but for scientific geography which shall now take the place of the preliminary work of pioneer explorers, and deal with the country as a whole instead of tracing it in outlines and in disjointed parts. In short, they require all gaps filled up. They want to know what the country contains in the way of forests, of open land suitable for agriculture, of desert and swamp, of opportunities for roads and railways, for telegraphs and irrigation, before deciding on the right position for the centre of an arterial system of public works which shall pervade in natural and orderly sequence,

and in due time, every part of the body of the country of their administration. Now this is scientific geography. It is not ordnance map-making nor anything very much like it. It is a comparatively new demand on the scientific resources of England, and those resources are by no means equal to the demand. Before considering resources, however, we must look to the scientific means to this geographical end. I have already referred briefly to the subject of geodesy, and I have told you that what is termed geodetic triangulation is a function of high scientific order, demanding not only minute and painstaking care on the part of an able staff of observers, but very considerable time and very considerable expense to carry it to a satisfactory issue. I have also pointed out that, inasmuch as the exact distribution into parts of any large space of the world's area must ultimately depend on the exact measurements which are a function of only the highest class of geodetic triangulation, we must look finally to geodesy to support the framework of our geography and to give it its rightful place in the great total of the world's mapping. But the demand for geographical mapping is not satisfied with the promise of an elaborate basis for the work which has first to be constructed with the expenditure of much time and money before anything in the nature of a final map can be produced for purposes of administration. The political world, too, cannot always sit patiently through all the international disagreements, the losses, the unrest, and the positive national danger to which an unsettled boundary gives rise, whilst the geodesist works slowly through the country year after year, piling up sheaves of equations and folios of observations, but never a square mile of practical topography. As for the military department, I hardly know what to say. There is the example before us of Germans, Russians, French, and Americans, all conducting their campaigns with maps in their hands, taking every special means at their command in order to acquire such maps before they commence operations; whilst the Boers have fought us to the bitter end with a practical knowledge of the country which is even better than maps, and which is exactly that class of knowledge which maps are supposed to replace or supplement. None of them wait for geodesy.

Certainly the attitude of the military department is not one of neutrality. They would like the maps, they are even anxious to get them, but they are not quite certain that they are worth paying for. However that may be, I can only express my own conviction that geographical mapping will be found to be an urgent necessity in every corner of the unmapped world subject to British influence. We would like to wait for those accurate determinations of geodesy which would at once furnish us with the best of all possible means for commencing a comprehensive geographical survey. But we cannot afford to wait, and the great geographical problem of the age is how to reverse the natural sequence of scientific procedure and to obtain maps of the unmapped world which no subsequent geodetic operations shall condemn as inaccurate. It is not a question of expediency; it has been one of necessity for many years past; and inasmuch as necessity is the mother of invention, I think that it will finally be conceded that means *have* been found for ensuring sufficient accuracy in geographical work to render it capable of enduring the subsequent tests of completed geodetic measurement without dislocation and without interference with the general utility of the maps, even if that accuracy be not scientifically perfect.

It is not my intention to bore you with technical details. I only wish to impress upon you that in the field of scientific geography, as in other fields, "the old order changeth." We must work on new principles in order to meet new demands.

Use of the Telegraph in Geography.—One of the chief means to this end is the telegraph. Few people appreciate the important *rôle* which is played by the

telegraph in these days in the field of geography. It was not so very long ago that the first step towards regenerating a natural wilderness, or for securing access to new commercial openings or centres of uncivilized population was held to be the construction of roads and railways. Means of physical access was the first step towards the development of a country which was regarded as unenlightened from the standpoint of European civilization. It is so no longer, for the telegraph often threads its way through many a dreary waste of unpeopled earth, uncoiling its length for hundreds of miles in advance of any railway, or indeed of any road which can in the ordinary sense of the term be described as a constructed road. I will give you an illustration. On the Patagonian pampas not so very long ago, in the midst of a wide wilderness of snow, after losing our way in a blinding snowstorm and camping on our tracks for the night, we struck the end of the telegraph line which is now being pushed across Patagonia, and which will eventually connect the Atlantic with the Pacific. We had seen no roads whatever for a great part of the distance we had traversed. Our daily procedure was the simple process of following a guide over the illimitable stretches of bush-covered uplands which reach down from the eastern foot of the Andes in gentle grades to the Atlantic shore; and when we did at last fall in with the great central line of trans-continental communication we found it to consist of the wheel-marks of certain previous waggons which had drifted along that way, a sort of road which it was exceedingly easy to lose in the fading light of a stormy winter's day. On this road there was nothing but a telegraph end and the tents of a few telegraph officials, and we were some 150 miles from our destination on the Atlantic coast. And so it happened that, after weeks of absence from any means of communication with the outside world, we were thus suddenly put in possession of its very latest news; and the very first message that passed from the end of that line into my hands was the message of peace with South Africa, signed an hour or two previously. I accepted that message as a happy omen for the result of our Patagonian mission. And thenceforward (thanks to the courtesy of the telegraph chief at Buenos Aires) nightly as we sat in the snow we read all that was important from the London evening papers of that selfsame day. We were not starving by any means, but had we wanted a loaf of bread in that unbroken stretch of snow-covered bushland we certainly could not have got it; whilst here was information flowing in with a daily ease and regularity that I greatly missed when once again I was within reach of clubs and civilization. The importance of telegraphs in the field of geography, however, is not confined to the transfer of news to casual travellers. It is the facility which it places in the hands of the geographer for determining his position in longitude that renders it so important a factor in the prosecution of a geographical survey. Every one knows that the first duty of a geographer is to discover his latitude and his longitude. Hitherto the determination of the first has been a matter of no great uncertainty, but as regards the latter, one can only say that the confidence expressed by most explorers in the results of their observations has never been justified by the final verdict of subsequent determination. It is, in truth, most difficult even for the most practised observer to obtain an absolute value in longitude on which he can rely within such limits of accuracy as are essential to the construction of a map where these values have to be employed deferentially. The telegraph places in our hands the means of differential determinations within a degree of exactness that surpasses even that of the most careful determination of latitude; and the telegraph is everywhere. Supplementary to the facilities of time-signalling by telegraph is the wonderful accuracy of graduation introduced into the smaller classes of new instruments which in these days replace the cumbersome equipment

of the past. With a small 6-inch theodolite fitted with a complete vertical circle, time values can be determined within a fraction of a second, and latitude values to within two seconds of arc, always provided that that great bugbear of the astronomical geographer, level deflection, does not interfere with his results. But the same minute accuracy in graduation which has so improved the ordinary little instruments which you find in the hands of the professional geographer has, when combined with new methods for accurate linear measurement, also placed it in his power to carry out a fairly coherent and systematic triangulation with great rapidity and accuracy over large areas of country whenever the configuration and characteristics of that country are favourable. Usually they are favourable. Large expanses of flat desert, of undulating veldt or of unbroken forest are the exception, not the rule, and they must of course be dealt with as their special peculiarities demand; and for the normal conditions of land configuration, given that the explorer is specially careful about his base measurements and his initial data, he can certainly with modern instruments and the facilities for check given him by the telegraph, carry on a rapid and comprehensive geographical survey which will fulfil all the conditions required by the administrator, economist, political geographer, or military commander within such limits of accuracy as will ensure its standing all the subsequent tests that geodesy may apply without any apparent map dislocation. And practically that is all that is wanted for a first map. I have used the word "rapidly." Few people (even scientific geographers) have really grasped the full meaning of the term as applied to surveys on geographical scales (*i.e.* 1:250,000—about 4 miles per inch, or less) under normal conditions. Such surveys can be completed quite as fast as an army can advance in the field, even granting that the advance is continuous. They can even, to a certain extent, precede that advance in face of an enemy. A single triangulator with a staff of two or three topographers in a fairly favourable country will be responsible for an outturn which may be counted by hundreds of square miles per day. The records of both American and Canadian surveys will prove that the marvellous progress made in the frontier reconnaissance surveys of India is nothing abnormal or unexpected.

Necessity for Training Schools.—So far I have spoken about the system only, a system which has been nearly perfected by experiments in Canada, Russia, India, and elsewhere. Now we have to turn from the work to the workmen. It is only lately, quite lately, that England has discovered that such workmen are wanted at all. Five or six years ago there was not a topographer nor a topography school in England. But the demand during late years has been insistent and constant, with the result, I am glad to say, that efforts have been made in various directions to start topographical schools, and a distinct change is apparent in our methods of instruction military headquarters. No purely technical central civil schools such as exist on the Continent are to be found in England, and the natural result is that at present England possesses no finished topographers and not many men who know what is meant by a geographical survey. In the wilds of Patagonia (which is, I must premise, a country beset with special climatic difficulties, but not otherwise one unsuitable to the topographer's art) I met many men of great intelligence and exceptional skill who had been gathered from various quarters for the purpose of topography. There were Italians, Argentines, Germans, French, and Swiss, but not an Englishman amongst them. Russians of the type of my old and unforgotten friend Benderski have long been famous for their skill; but although English administrators and soldiers are alike crying out for more and better assistance in the active field of topography, they cannot get it from England. The establishment of a school of practical geography such as must eventually guarantee the existence of

a military topographical corps would be a matter of congratulation deserving to be noted as an important step in the advance of the geographical education of the country, no less than the school at Oxford which deals more directly with civil interests, and is rightly most concerned with the academic aspects of geographical instruction. Even this, however, is hardly sufficient. I am convinced that the recommendation which arose from certain resolutions found in the Geographical Section of the British Association Meeting at Bradford two years ago in favour of the employment of natives in Africa for African work, just as Indian natives are employed in India, is thoroughly sound. We want schools in Africa as well as in England. Only in this way will the vast areas still unmapped in our African protectorates be dealt with at reasonable cost and in a reasonable space of time.

Photo-topography.—Certain developments in the practical field of geography have lately been brought to the test of continued experimental application, and the progress of these experiments deserves a passing record. Notably the application of photography to purposes of geographical illustration has received immense impetus from the apparent facility with which the experimental media can be handled. In favour of the haphazard landscape illustrations with which we are usually deluged by travellers there is little to be said. They are far more frequently illustrations of the personal progress of the author than of the general character of the country he progressed through. Neither is there much more to commend in photographs designed to reproduce geological or tectonic features, glacial configuration, special orographical conditions, or the like unless the position of them and the direction of the line of sight from the point of view are very clearly indicated on a corresponding map. At the best they are apt to be deceptive, for the reason that they can but deal with one side of a subject and with only a partial view of the particular feature they represent. Every one knows that an apparent range, or even a system of ranges, of mountains may be nothing but the *revêtement* of a high plateau or tableland; but the photograph of such a mountain system will give no indication of the plateau beyond the range which can indeed only be determined by a survey, and properly illustrated by a map. I need hardly say that a topographical delineation of ground derived from observations made by the aid of photography demands as much technical skill on the part of the topographer and as much systematic application of the use of instruments as any other survey. It must be a combination of careful triangulation and skilful plane-tabling precisely as is the product of a topographical survey. It demands, if anything, more special training and a more elaborate method of procedure than does ordinary survey. So far as the results of experiments made over suitable fields in Canada can teach us, the verdict is in favour of the process only under certain conditions of light and climate when it is desirable to obtain a record of observations in as short a space of time as possible, either in high altitudes, when passing clouds afford but a fleeting view of the landscape, or in low-lying districts, where active tribal hostility in the field or some similar condition renders it desirable to curtail operations as much as possible. Under all other ordinary conditions it is maintained by Canadian surveyors that, although both time and labour may be saved on the field operations, the resulting map can never attain the same standard of accuracy in detail that distinguishes good topographical illustration of the usual variety of natural features. I am, of course, now speaking of geographical surveying as an art, not of mere geographical exploitation. In the latter case, doubtless every traveller who can "pull the string" in these days can add immensely to the personal interest of his journeys by his illustrations of them. But I would earnestly impress upon all travellers that if they desire those illustrations to be of any use

for geographical compilation, it is absolutely necessary to know the point from which they were taken and the direction of the view.

Barometric Records.—Once again, too, would I warn travellers of the utter uncertainty of all classes of barometric determinations for altitude. Very little has been done in recent years towards improving instruments of the barometric class, and meteorological science has not yet taught us how to deal with the constant variations in air-pressure produced over local areas by changeable weather. There are some countries where barometric records can hardly be regarded as offering a clue even to differential heights. It cannot be too often insisted on that the determination of the relative heights of mountain peaks and of the local value of refraction by means of the theodolite is as much the duty of the triangulator as is the fixing of those peaks in position for the use of the topographer. From these again the altitude of positions in the plains can be safely determined by small instruments of the clinometer class without resorting to the barometer at all, although it may still be necessary to ascertain the value of one initial (or final) point which must be determined by many observations spread over a considerable length of time and synchronous with another set of observations determined at sea, or some already known, level. This, of course, will occur only when a new geographical area is opened up to survey at some distance from the sea.

Universal Mapping.—It will be remembered that a scheme was set afloat some years ago by Dr. Penck, the eminent German geographer, for the mapping of the whole world on the scale of one-millionth, which is very nearly equivalent to the scale of 16 miles to 1 inch. Substantial progress has now been made in support of this scheme by English map-makers, especially in India, where all the trans-border countries which have fallen geographically into the hands of Indian surveyors are now being mapped on this scale. In the commencement of all great colonial survey schemes, it is much to be hoped that this project for one homogeneous and universal map will not be lost sight of.

Map Spelling.—I wish that we were as well on the way towards homogeneity in spelling as we are in scale; but it is much to be feared that arbitrary rules will have to be applied to so many special localities that no universal system is ever likely to be adopted. The further that exact geography extends the more difficult becomes this problem, until at last we shall probably arrive at the conclusions adopted long ago by the Government of India, and consider it best to lay down by order an arbitrary list of prominent names, and rule that the spelling of them shall be maintained as in this list in all Government records and maps. Scientists may disagree, but after all it seems the only practical way out of the confusion that exists at present.

Terminology.—There is yet another subject of world-wide interest to the geographical student equally with the practical geographer which requires something of the erudition of the philological scholar to be brought to bear upon it in order to arrive at a satisfactory issue. I refer to the subject of geographical terminology. It may seem an easy thing to be satisfied with such general definitions as are involved in the terms "range of mountains," "coast-lines," "main channels," "watersheds," "slopes," "affluents," and the like; but when these terms, and terms similar to them, are employed in international agreements and treaties, carrying with them the necessity for identifying on the face of nature the feature which corresponds to the term employed, there is always to be found room for discussion as to what its exact meaning may be. For the variations of nature are infinite, and no two features classified under the same generic name are alike. Were I to give you examples of only a few of the geographical expressions which, carelessly used, have led up to serious international disagreements, you

would, I am assured, agree with me that it is high time that geographers all the world over came to some definite understanding about the meaning of geographical terms. To take an instance. What is a "range" or a "main range" of mountains? Where does it begin? Where does it end? How far does the term involve geological structure? When a continuous line of similar structure is split across the axis of it, does it become two ranges or does it remain one and the same range? Or, again, what is "the foot of the hills"? Is it where the steep slopes end and the talus or gentle gradients of its detritus commence, or must you follow the latter down to the nearest watercourse? If you talk of the coast-line of Western Patagonia or of Norway, do you include such headlands as are connected with the mainland at low water, and exclude the islands, or do you mean the coast-line of both? What is the main channel of a river? Is it where the flowing water scours deepest from time to time, or is it a fixture amongst a score of minor channels that shift and change? Perfect definition is of course hopeless. It is not in the power of man to deal with all the infinite variations of geographical feature and to classify them as he would specimens of botanical origin or of natural history. But we might arrive at a much more satisfactory dictionary of geographical terms in our own language than at present exists, and we might offer that dictionary to the geographers of the world at large and say, "Here we have at least endeavoured to explain our meaning when we make use of geographical expressions. This is what is taught in our schools as the best means of translating the general idea into a distinct mental conception of natural features; and in future when we use these terms you will know on the best authority that England can produce what it is that we mean by them." Then possibly, instead of having to turn to Germany and France for assistance in expressing ourselves clearly when drawing up legal documents dealing with geographical conditions, we may find the English language become the standard for this special class of literature in spite of its verbal poverty. This at any rate is what is now being attempted by the Geographical Society, which spares no effort in order to obtain the best literary assistance in its compilation that the country affords. We shall soon have a geographical dictionary, I trust, and be able to enter with a little more ease and confidence into the field of literary discussion of geographical subjects.

Progress of Geographical Education.—The progress of geographical education in the country, although it is by no means so universally apparent as might be considered desirable, yet shows encouraging symptoms of vitality in many directions.

The Civil School at Oxford, for instance, conducted by Mr. Mackinder, has already made most successful efforts to produce expert teachers of geography. Here, in addition to 208 students (of whom 163 were men) attending courses during the past year, five students have already won the Post-graduate Diploma granted by the University, and it is encouraging to note that four out of the five have already obtained distinctively geographical work. Others similarly qualified, if of sufficient ability, would probably not have long to wait for opportunities. In addition to its regular University functions, the Oxford school has this year organized a summer course of three weeks' study. This has been well attended by teachers and instructors from all parts of the country, and even from America.

In London a department of economic geography is in course of organization at the School of Economics and Political Science, and geography will become a compulsory subject in examinations. In the matter of examinations we have to chronicle the issue of a most excellent syllabus for the new London Matriculation, which should ultimately have great influence on the teaching in many schools.

Further, the "Geographical Association," a body now of seven hundred teachers, has made great progress. It has recently commenced the issue of a journal known as the *Geographical Teacher*, one of whose functions appears to be the criticism of the questions set in various public examinations.

Satisfactory progress has also to be recorded of the School of Surveying initiated by the Royal Geographical Society, now under the superintendence of Mr. Reeves. The diploma of the Society has been awarded to about 25 students, who have in all cases found suitable employment as surveyors subsequently. Indeed, the demand for trained surveyors of the Society's school already exceeds the supply, although it cannot as yet be maintained that our means of training are as perfect as we could wish.

In military schools the report of the late committee appointed to consider the education of army officers shows clearly enough that amongst all the necessary subjects for a cadet's education which have to be crammed into the exceedingly short course of his military schooling, that branch of geography which is embraced by the term "military geography" finds a very conspicuous place. The short course of a military school will never turn out an accomplished geographical surveyor; nor does it in any way outflank the necessity for a military school for professional topographers. But it teaches the young officer how maps are made, and instructs him in the use of topographical symbols. It would be well if it could be pushed a little further—if it could teach him how to make use of the maps when they *are* made—for personal experience convinces me that the apathy shown by many of our foremost generals and leaders on the subject of maps arises chiefly from a well-founded doubt of their own ability to make use of them. As for the broader basis of general geographical instruction which would deal with the distribution of important military posts and strategic positions throughout the Empire, and teach officers the functions of such positions, either individually or in combination, during military or naval operations, it is perhaps better that such a strategic aspect of geography should be relegated to a later age, when the average intelligence of the cadet has become more fully developed.

Taking it for all in all, there are distinct signs of a more general interest and more scholarly standard of thought in the subject of geography. This is probably due to the efforts of a comparatively small group of workers at a time of general educational reform, possibly partly stimulated by the disclosures in connection with the late war.

The methods of further improvement are simple—better teachers and better examining—and for both it is probable that we must look more directly to civil sources than to the tentative efforts of the military schools.

RECENT PAPERS ON THE KARST LANDSCAPE.

A NUMBER of papers have recently appeared dealing with the physical characteristics of the limestone region of the Dinaric alps, of which the Karst is taken as the typical district, and to which the Karst has given its name. Prof. W. M. Davis, of Harvard, contributes an account of an excursion made with Prof. Penck and his students to Bosnia and Herzegovina to the *Bulletin* of the Philadelphia Geographical Society (vol. iii.). It affords an excellent introduction to the study of the region, as it gives descriptions by a highly competent observer of the characteristic land-forms of the Karst, with here and there hints as to their probable history. In addition to points which are more elaborately discussed in the papers

noticed below, special attention is called to remarkable waterfalls, which are due to deposition and not to erosion. These are formed by travertine laid down in the bed of the river. The falls of the Kerka and the long narrow lake-like expansion above them are the best example.

Prof. Penck has also written an account of the districts visited in this excursion. Some of the more important points in Prof. Penck's "Geomorphologische Studien aus Herzegovina" (*Zeitschrift des Deutschen und Oesterreichischen Alpenvereins*, xxi. 1900) may be noticed. The opening chapter deals with the aridity of the land, its hollowed surface, the absence of accumulations of rock waste, and the formation of the layers which compose it.

The aridity is not due to lack of rain, for over 60 inches falls on an average every year. The rain immediately disappears through the porous limestone, but flows beneath the surface, whence it may be seen to issue in gorges such as that of the Narenta, which receives few tributaries, but is nourished by waters from many springs in its bed or falling in cascades from caves above it. The Narenta is the only river which flows in an open channel to the sea. The Ombla, which appears from underground, and enters the sea near Ragusa, is fed by part of the waters of the Trebinyčica and Mušica.

The land is pitted with sunken areas, some of which are the passage-ways of surface-water underground—the smaller sinks or swallow-holes or dolines,—others exist where underground streams appear, flow, and disappear—sunken fields or polyes, which, as a rule, are much larger than the sinkholes. The polyes have usually a flat surface covered with sand or loam, rarely with gravel. Transition forms occur—for instance, the Nevesinye polye is no longer crossed by a river, but has innumerable flat sinkholes through which the water disappears. The dolines are much more widely distributed than the polyes, and are common enough in our own chalk and limestone ridges. The polyes are related in an unmistakable manner to the structure of the land. They strike north-west to south-east like the main ridges and furrows. In spring, when the rains are heavy, the drainholes become choked, the floors of the polyes are flooded, and Herzegovina becomes one of the richest of lands in lakes. These lakes are short-lived, for in summer they disappear, leaving fertilized fields, which are cultivated.

The polyes are not the only peculiar phenomena in the Karst landscape. There is an absence of a talus of waste at the mountain's base, such as is common in the limestone Alps and elsewhere. Here the wonderfully pure limestone is all dissolved by running water, and chemical erosion overpowers mechanical erosion. This is manifest in the few fragments which can be picked up, for they are all grooved and often pierced with holes. The absence of waste and of soil for plant-growth permits the structure of the land to be seen in an unusually clear way, and strata can easily be followed for miles. This makes the region one of the best for many special researches. Here is a mighty complex of cretaceous limestone, which is bent or broken in Z shapes along definite lines; raised in the north-west, sunk in the south-east; so that older rocks are raised in the upper angle of the Z in Dalmatia, and younger rocks are jammed together in the lower angle in Herzegovina.

The second chapter deals with the relation of the strata to the surface forms, denudation, the counterfeiting of accumulation forms by denudation forms, the great levelling, its age, the mosors, transmission of forms, polyes, dry valleys. The polyes, strata, and ridges strike north-west to south-east, and there is a general relation between the structure and configuration. Great denudation has taken place since the layers were folded, and the general correspondence of structure and configuration cannot everywhere be found. Foldings occurred after the early Tertiary

strata were deposited, and faultings still later. Young Tertiary conglomerates tell of denudation, but no trace of well-marked valleys exists. Broad-shouldered mountains (Mosor Planina is 4365 feet high), with soft lines, and only on the sea side with any trace of steep walls, recall the contours of the Central European Highlands, except at their bases, where the seeming talus turns out to be rock (cf. McGee's observations in Sonora, Mexico, and Penck's in the Sierra de Guadarrama, Spain). The flat areas, above which the mountains rise, in which the polyes sink, may cut obliquely inclined strata, yet they are erosion plains. Such is the whole of Herzegovina, from the Narenta below Mostar to near Lyubuški. There is no evidence of marine transgression, and these plains must be accounted immense and old valley floors, the lateral erosion of the old river being now replaced by vertical erosion, *e.g.* of the Narenta, and this lateral erosion must have taken place when vertical erosion was no longer possible, and the stream had reached its base-level. The mountains are the remains of originally tectonic ridges; they look like mountains which rise above erosion plains, and we must picture the young Tertiary landscape here as one of gently undulating heights between broad plains, partly of erosion, partly of deposition. The mountains are not Davis's monadnocks, associated with some more resistant rock, but the remains of aboriginal heights, and may be called Mosors, after a name common in Dalmatia. That the mosors are relics of original heights seems certain from the false talus, which, however, represents what was once a real talus of limestone, now dissolved, but imposing its shape on the underlying rocks. The false talus is an inheritance from a real one. All the mountains are not mosors, for block mountains exist, *e.g.* Biokova Planina.

While the mosors are relics of original heights, the polyes are more recent excavations in the flat areas, and their margins must be considered fault escarpments, but, in some cases, where these slope gradually, the impression is given of a down folding (*e.g.* Mostarsko Blato). The region certainly has undergone recent crustal deformations, as the young Tertiary layers show, and the Tertiary layers remain in the polyes because they were lowered there; elsewhere they have been almost entirely removed, but occasional pebble-beds bear evidence of their former existence.

In the last chapter the Karst phenomena are traced to Pliocene times, after the central band with its mosors had been raised through faultings. This permitted new valleys to be formed, and traces of them remain in the usually dry valley between the Gacko and Nevesinysko polyes. As the ground-water level fell, the surface water sank through the extraordinarily porous rock, and made its way to the sea by courses determined by the relative uplift of the land.

Dr. Jovan Cvijič describes a number of polyes in the *Abhandlungen der K.K. geographischen Gesellschaft in Wien* (III. No. 2, 1901), and gives a final chapter on their development. Polyes are in almost all morphological characteristics only large dolines, and both were until recently explained as due to the falling in of cavern roofs. When dolines were proved to be due to erosion, the polyes were explained as valleys, but they differ from the blind valley both in morphological and hydrographical characteristics. The difficulty is to account for the parallelism between the major axis of the polye and the strike of the rock layers, and its peculiar hydrographical conditions with several independent stream outlets in the same locality. Dr. Cvijič's researches have led him to consider the uvala (*Karstmulde*) as an intermediate form between doline and polye. The uvala is a large, broad sinking in the karst with uneven floor, formed by the breaking down of the wall between a series of dolines. These uvalas possess the chief characteristics of polyes, for their major axes agree with the strike, but they differ from them in their irregular floor, and they lack the special hydrographical

conditions of polyes. Transition forms, however, occur both to dolines and to polyes. The uvala may possess the beginnings of the hydrographical conditions of a polye, for sometimes in the dolines within the uvala water springs up in very wet years and inundates the floor (as at Plana, north of Bilek). On the other hand, in many polyes traces can be found of older uvalas, for their floors are not quite even, are pitted with dolines, and lack rivers (Vukovsko and Kupresko polyes). Beside the flat part, most polyes are fringed round the edge with a marginal belt, possessing uvala characteristics. In fact, in the polye denudation has gone a stage further than in the uvala.

In the Bosnian and Herzegovinian karst land two kinds of plains pitted with dolines and uvalas can be distinguished, (*a*) the high plains between the polyes, and (*b*) the low-lying plains formed by the polye floor. The upper plains are due to chemical denudation by an infinite number of small watercourses constantly altering their beds (cf. Penck in note above). When the walls between adjacent dolines are eaten away, an uvala is formed, whose bed is lowered to that of the ground water, and springs appear and form small streams. Such uvalas are but small polyes, and by the junction of several, a large polye (*e.g.* Kupresko) is formed. At first the supply of water is greater than can be run off through the sinkholes, or these may be stopped up, and the water rises in the bed of the polye and tends to level it. Most of the polyes of Bosnia-Herzegovina exhibited this lake-phase in Neogene and early Diluvial times, as the deposits show. Hence the upper denudation plains are older than those of the polye floor, which may be either river or lake levels. All three phases can be seen in the Gatačko polye.

The Neogene marls and loams are much disturbed at the margin, less so in the centre, and these disturbances show a prolongation of crustal movements after Neogene times. These are greatest along the fault lines, which usually follow the north-east margin of the polyes, the movement forcing the north-east wall of the polye inwards over the polye. The Neogene terraces on the north-east side may be 15 metres higher than those on the south-west, and the Diluvial one 5 metres; and the beds of the polyes are usually inclined from north-east to south-west, and the streams flow in this direction. Hence we may conclude (1) that the bed of the Adriatic has sunk since Diluvial times; (2) the sinking is greater the nearer the Adriatic is approached, as the relative figures above show; (3) that probably the Danube-Adriatic divide has moved to the north-east; and (4) that this sinking is not so marked in more recent times.

The fringing terraces of the polyes lead Dr. Cvijič to some interesting conclusions. The Neogene terraces contain alluvial cones which are absent from later ones, and probably are due to more active erosion in the colder and wetter climates of Glacial times, yet few traces remain of the ancient valleys. With the smaller evaporation, the water accumulated in the polyes, hollowed out to the ground-water level, formed marginal terraces, and the surplus in many cases flowed off at the surface, where traces of their courses can be found to-day. The lake in the Livanysko polye may have been 100 feet deep, but the posthumous dislocations make such estimates uncertain. Few lakes remained in Diluvial times, and those may have been 50 to 65 feet less deep. Dr. Cvijič thinks that the regular succession of post-Diluvial terraces can best be explained by secular climatic changes, and not by stoppages of the sinkholes.

A. J. H.

THE RECENT EARTHQUAKES AND VOLCANIC ERUPTIONS.

THE preliminary report of Dr. Tempest Anderson and Dr. J. S. Flett, who went out on behalf of the Royal Society to examine the scenes of the eruptions in St. Vincent and Martinique, has been published in the *Proceedings* of the Royal Society (vol. lxx. pp. 423–445). The account given of the great outburst at St. Vincent, compiled after full examination of the locality and collecting and sifting of the evidence of eye-witnesses, modifies the earlier descriptions to the extent of abolishing the streams of lava, and substituting in their place streams of boiling-hot water flooding the beds of the rivers Wallibu and Rabaka, the result of the escape of the crater lake. Further, it comes out that the chief loss of life was occasioned by a "hot blast"—a "strange black cloud which, laden with hot dust, swept with terrific velocity down the mountain-side, burying the country in hot sand, suffocating and burning all living creatures in its path, and devouring the rich vegetation of the hill with one burning blast." There is nothing to show what was the velocity of the blast when it left the crater, but "After a couple of miles it was that of a hurricane or tornado. . . . At 4 miles from the crater the blast was travelling at 20 to 40 miles an hour, and rapidly slowing down. . . . When it reached the sea near Chateaubelair it came over the water with a wave before it, but it did not overturn the small boats which lay in its course." At Martinique the observers were fortunate enough to witness an eruption at Mont Pelée, the description of which concludes with the following paragraph:—

"There can be no doubt that the eruption we witnessed was a counterpart of that which destroyed St. Pierre. The mechanism of these discharges is obscure, and many interesting problems are involved. But we are convinced that the glowing avalanche consisted of hot sand and gases—principally steam; and when we passed the hill in R.M.S. *Wear* a few days later we had, by the kindness of the captain, an excellent opportunity of making a close examination of the shore from the bridge of the steamboat. The south-west side of the hill along the course of the Rivière Sèche was covered with a thin coating of freshly fallen fine grey ashes, which appeared to be thickest in the stream valleys. The water of the rivers flowing down this part of the hill was steaming hot. This was, undoubtedly, the material emitted from the crater on the night of the eruption. There was no lava. We saw no explosions of combustible gases, and nothing like a sheet of flame. We were agreed that the scintillations in the cloud were ordinary lightnings, which shot from one part of its mass to another, and partly also struck the sea beneath."

"The most peculiar feature of these eruptions is the avalanche of incandescent sand and the great black cloud which accompanies it. The preliminary stages of the eruption, which may occupy a few days or only a few hours, consist of outbursts of steam, fine dust, and stones, and the discharge of the crater lakes as torrents of water or of mud. In them there is nothing unusual, but as soon as the throat of the crater is thoroughly cleared, and the climax of the eruption is reached, a mass of incandescent lava rises and wells over the lip of the crater in the form of an avalanche of red-hot dust. It is a lava blown to pieces by the expansion of the gases it contains. It rushes down the slopes of the hill, carrying with it a terrific blast, which mows down everything in its path. The mixture of dust and gas behaves in many ways like a fluid. The exact chemical composition of these gases remains unsettled. They apparently consist principally of steam and sulphurous acid. There are many reasons which make it unlikely that they contain much oxygen, and they do not support respiration."

The *National Geographic Magazine* devotes the whole of its July number to a

series of papers on the May eruptions in Martinique and St. Vincent. Mr. Robert T. Hill, after a few notes on the voyage with the *Dixie* relief expedition, describes the general geographical and economic conditions of the Windward islands, and of St. Vincent and Martinique in particular, before the present great outbreak of volcanic activity. The detailed account of the St. Pierre disaster, based on very full investigations made on the spot, brings into prominence some features of the outburst which suggested themselves as remarkable in the earlier reports. Amongst the chief conclusions reached by Mr. Hill, we may mention the following:—(1) The thirty thousand people of St. Pierre were exterminated within a few minutes and the town set on fire by the sudden eruption of a volcanic cloud; (2) the fatal cloud came from the lower vent, 2 miles north of the city; (3) the vapours coming from the volcano were and are sulphureous; (4) there was force accompanying the eruptions of the morning of May 8 of great destructive nature, which left much evidence that the gases within the cloud exploded after having reached the air; (5) the summit eruptions were and are accompanied by tremendous electric phenomena; (6) a great magnetic storm accompanied the eruptions of May 8, which was recorded at remote points, and which indicated a connection between them and the volcanic eruptions. The presence of sulphureous gases is inferred from the fact that "every metal relic susceptible to sulphur discoloration showed its blackening effect." It appears that the destructional force was aerial, not terrestrial, and "it is impossible to conceive that this force was initial from the volcanic vents, 2½ and 5 miles distant." The action of the force was apparently radially from a centre situated near the north end of the city, and there is evidence of a "return force" and of a great reduction of air-pressure on the perimeter of the devastated area.

The second paper consists of a letter from Prof. Israel C. Russell, covering a good deal of the same ground, but referring at greater length to the eruptions in St. Vincent. The rest of the number is devoted to a paper on the volcanic rocks collected by Messrs. Hill and Russell, by J. S. Diller; a chemical discussion of analyses of volcanic ejecta from Martinique and St. Vincent, by W. F. Hillebrand; and to a compilation of reports of vessels as to the range of volcanic dust, by James Page.

These reports, which together form a unique contribution to our knowledge of volcanic phenomena, show that the eruptions in Martinique and St. Vincent were of similar type, that in St. Vincent being apparently the more extensive and violent of the two, and expending a greater part of its total force in a vertical direction into the upper atmosphere. They further agree in concluding that the chief damage and loss of life was occasioned by the remarkable hot blasts, with their accompaniments of incandescent sand and the black "cauliflower" cloud, reminiscent of the mammary or "pocky" cloud of Clouston. Both indicate that the hot blast consisted of a mixture of air, steam, and a gas containing sulphur, probably sulphuretted hydrogen in the first instance, although apparently direct evidence on the point is still wanting. The great problem for investigation, however, is the dynamics of the hot blast. The phenomena in St. Vincent described by Drs. Andersen and Flett might possibly be the direct result of an explosion in the crater, like the effect of firing an immense cannon along the ground, but even there such an hypothesis is not wholly satisfactory, while in Martinique it does not seem to account for the facts, especially as described by Mr. Hill. The motion of translation of the cloud was probably complicated by the mixture of gases composing it being in parts inflammable, in parts possibly explosive, and it was likely to be accompanied by vortical movements of an obscure nature, resembling those of a tornado.

In relation to the eruption of Mont Pelée, on May 8, Dr. L. A. Bauer contributes a paper on the magnetic disturbances to *Terrestrial Magnetism*. The hour of the greatest disturbance observed at the stations of the Coast and Geodetic Survey coincided with the destruction of St. Pierre; the element chiefly disturbed being the horizontal intensity. A number of magnetic disturbances of the same character have been recorded on other dates, some preceding the great eruption, and others, notably one on May 20, coinciding with the later outbursts. Other papers which should be mentioned have appeared in *Petermann's Mitteilungen* for June, in the *Revue Générale des Sciences*, in the August and September numbers of the *Century Magazine*, and in the *Strand Magazine* for September.

Since the notes on the West Indian eruptions, published in the July number of the *Journal*, were written, there has been an almost continuous succession of reports of volcanic and seismic disturbances from various parts of the world. According to a letter from the superintendent of the Eastern Telegraph Company at Banyuvangi, in Java, published in *Nature*, the Rooang volcano, 35 miles to the west of Banyuvangi, threw up large columns of vaporous cloud from May 1 to May 4. Magnetic disturbances at the time of the Mont Pelée eruption have also been reported from Oahu island, in the Sandwich group, and the Kilauea volcano erupted violently on June 3. On June 19 Mont Pelée ejected quantities of mud, and on the same day it was reported at Calcutta that the Himalayas had been shaken by an earthquake throughout their whole length. An earthquake was reported from Calabria on June 22. A severe earthquake occurred at Salonika on the afternoon of July 5, the shock being recorded at Birmirgham. Slight shocks were felt at Cheadle on July 8. On July 9 an earthquake occurred at Bandar Abbas, and shocks were felt in the Persian Gulf on July 9 and 10; the centre of disturbance was apparently Kishm island. On the same day occurred the eruption of Mont Pelée witnessed by Drs. Anderson and Flett, and loud detonations from La Soufrière at St. Vincent were heard at St. Thomas and Barbados. Another eruption of Mont Pelée occurred on July 12. On July 17 strong earthquakes occurred at Kingstown, St. Vincent, the most violent, at 9.45 a.m., being accompanied by loud rumbling sounds. It was reported that the ridge between the two craters of the Soufrière had collapsed, blocking the throat of the crater. Up to July 31 two slight eruptions of the Soufrière occurred, and a cable ship reported that at a point 18 miles to the northward the depth of the sea had increased to over 1000 fathoms. Other reports announced the opening of a crater in the Pico de Europa mountains in Spain, from which clouds of steam issued; a submarine eruption off Horta in the Azores, and unusual activity in the volcanoes of Costa Rica. On July 27-28 earthquakes occurred in Nebraska, Iowa, Southern Dakota, and California; between the 27th and 31st no fewer than seventy-five shocks were recorded in Southern California alone. On August 3-4 earthquake shocks were felt at Leiria, Portugal, and on the night of the 4th at Carrara. On August 10 an earthquake was recorded at Skagway. About August 13–15 the island of Tori Shima, between Japan and the Bonin group, was overwhelmed by an eruption; the island was reduced to ruin, and all the inhabitants, numbering about one hundred and fifty, perished. Mont Pelée showed renewed activity on August 15, and on August 21 was in violent eruption. Next day, Mont Altomonte in Calabria erupted; seismographs in the Isle of Wight, and in Hungary and Alsace, were disturbed, and shocks felt near St. Petersburg. According to a telegram from General Chaffee to the United States War Department, four hundred shocks were experienced in the Philippines between August 21 and 25. On the night of August 25 Mont Pelée again erupted, and immense quantities of dust were ejected, dust falling in Dominica, where loud detonations were heard. Another violent eruption of Mont Pelée occurred on

August 28, and three paroxysmal outbursts on August 30. Morne Rouge and Ajoupa Bouillon were destroyed, and many lives lost: it was impossible to reach St. Pierre from the sea. On August 30 a violent earthquake occurred at Carupano, Venezuela, accompanied by rumblings and noises which were heard for great distances. An earthquake was reported at Gubbio, Italy, on September 1. On September 3 Mont Pelée was again in eruption, and on the 4th the Soufrière at St. Vincent, after being almost quiescent from May 18, broke out afresh. On the 8th earthquake shocks were experienced simultaneously at Pau, Saragossa, and San Sebastian, and it was reported from Calcutta that serious disturbance had shaken the whole of the alluvial basin of Assam and Chittagong. Vesuvius and Stromboli were active on September 10, and a telegram from Seattle stated that the volcanoes Redoubt and Iliamna, in Alaska, were sending forth clouds of smoke and steam. A telegram from Kingston, dated September 17, stated that both craters of the Soufrière had been active since the 11th.

The general impression conveyed is that the northern end of Martinique is doomed; steps are already being taken by the French Government with a view to its possible evacuation. St. Vincent, and possibly other islands of the West Indies, are in some danger of destruction, while the general disturbance of the earth's crust gives signs of increasing and becoming more widely spread.

H. N. D.

THE ARCTIC EXPEDITIONS—RETURN OF SVERDRUP, PEARY, AND BALDWIN.

From the full account of the programme laid down by Captain Sverdrup on his departure, which was published in the thirteenth volume of the *Journal*, it will be remembered that the central object of the expedition was to complete the exploration of the northern coast-line of Greenland, and to set at rest the question whether that coast formed the termination of land in this direction, or whether it was succeeded to the north by groups of islands such as have been found in so many parts of the polar area. The possibility of adding to our knowledge of the ice-conditions of the far north on the American side, where some have supposed the ice to be more stationary than it has been found to be on the opposite half of the polar basin, was also kept in view. The news received in the autumn of 1899 showed that the conditions during the first season had been unfavourable to the attainment of a high latitude on the Greenland coast, the *Fram* having been caught by the ice in the vicinity of Cape Sabine, where the expedition had been forced to winter, the enforced stay in this comparatively low latitude being utilized for the exploration of Ellesmere land. Captain Sverdrup still hoped to carry out a survey of northern Greenland, proposing to undertake a sledge-journey if necessary, and send the *Fram* round to meet his party on the east coast. In the absence of authenticated information, it has therefore been thought probable in some quarters that the expedition had made its way to East Greenland, and would eventually be heard of in that quarter. Sir Clements Markham, however, in a memorandum recently drawn up on the probable position of the missing explorers, maintained the view—which now proves the correct one—that the *Fram* made its way by Jones sound to the unknown region north of the Parry islands.

Captain Sverdrup, in a telegram to the *Times*, has given an outline of his four years' experiences, of which the following is a summary:—

During the first winter the innermost part of the fiord formerly known as Hayes sound was partially explored and mapped, and a hut built, which it was

proposed to transport to Robeson channel or some point still further north, to serve as winter quarters and the starting-point for a sledge expedition round northern Greenland to Sabine island. Early in 1899 two sledge journeys were made across Ellesmere land to the west coast: one leading over ice, the other—more to the north—over non-glaciated country. The mapping of Hayes sound was also completed. The summer, however, again proved unfavourable, and, it having been found impossible to take the *Fram* north, it was decided to attempt the route *viâ* Jones sound, south of Ellesmere land, discovered by Baffin in 1616 and traversed for some distance by various explorers during the nineteenth century, but never before followed to its point of junction with the polar sea beyond. An interesting field for exploration therefore lay in this direction. Quarters for the winter of 1899–1900 were taken up on the south side of Ellesmere land in 76° 29′ N., 84° 25′ W., and reconnaissances made of the coasts of the sound, which was found to run further west, without turning north, than had been supposed by Inglefield in 1852. A depôt of stores was established, and preparations made for sledge expeditions during the following spring. A preliminary trip early in March showed that open water with drifting ice already existed in the sound between North Kent island and Ellesmere land. The main expedition left the ship in two parties on March 17 and 20, all starting together from the depôt (named by the explorers Björneborg) on the 23rd. The rugged nature of the ice made travelling difficult, while a temperature of −44·5° Fahr. was experienced. A return party having been sent back on the 31st, the exploration was continued by two parties of two men each. A large bay 100 miles broad was found to run east from the neighbourhood of North Kent island, with complicated ramifications to the north. Fifty miles further west the land trends north and north-west, and is very hilly and intersected by fiords. In spite of fog and severe weather, Sverdrup and his companion Fosheim reached 81° N., then returning to Björneborg, which was reached on June 2. Isaachsen and Hassel travelled west, reaching a new land in 98° W., and then, turning south and east, traced a large system of fiords to about 79° N., the land being here very low. Other explorations, chiefly geological, were carried out by a third party, as also by the return party of the main expedition.

During the leader's absence the *Fram* had narrowly escaped being entirely destroyed by fire, but fortunately water was at hand in sufficient quantities to extinguish it. Early in August the ship was free of the ice, and steamed west on the 9th, but was again held fast from the 16th to the same date in September, after which the *Fram* proceeded through Cardigan strait and went into winter quarters in 76° 48′ N., 89° W. An attempt was made by Sverdrup to reach the large fiords to the north, but it was frustrated by a violent storm.

After a very stormy and cold winter, parties were sent out in March to lay down depôts, the weather being still boisterous and intensely cold, the thermometer falling even below −58° Fahr. The main expeditions set out on April 8, 1901, Sverdrup going north in search of a passage between Ellesmere land and the lands discovered the previous year, while Isaachsen again went west. The northward route brought the leader (apparently in part by a land passage) to the system of fiords traversed in 1900, which were followed to 80° 30′ N., where the land was found to trend westward, bad weather then necessitating a return. The western explorations disclosed, in about 78° N., a sound separating North Cornwall from another land to the north. Pushing on in this direction, Sverdrup reached a point in 79° 30′ N., 106° W., where the land trended east and south, none being visible either to the west or north, but only rough polar ice. The return was made by the south and east, so that the islands discovered were explored all round.

Among other explorations carried out during this summer was one of North Devon by a boat expedition. The ice conditions were very unfavourable, and when towards the end of August the ice round the vessel still resisted all attempts at blasting a passage, it became evident that another winter must be spent in the same quarters. In the following spring the principal attention was devoted to the region extending north to Aldrich's furthest point on Grinnell Land. This, however, was not reached, the turning-point being in 81° 37′ N. The north coast of North Devon was also explored, and a sledge excursion made to the British depôt on Beechey island, which was found to have been destroyed. Various work was done during the summer, and the *Fram* was finally able to start on the homeward voyage on August 6, reaching Godhavn on the 18th. Owing to a mishap to the machinery the greater part of the voyage thence was made under sail only.

Although fuller details must be awaited before the exact nature of the geographical discoveries can be comprehended, it is evident from the above that some really good work has been accomplished, which will throw light on a portion of the American polar archipelago lying off the routes of the various Franklin search expeditions of the middle of last century.

After an absence in the Far North of over four years, the whole of which have been spent in strenuous exertions in the cause of polar discovery, Commander Peary has at last returned to civilization, unsuccessful, it is true, as regards a near advance to the Pole, but having accomplished an amount of good work in the face of great obstacles, which has certainly enhanced his previously high reputation as an intrepid and persevering explorer. The *Windward*, which, as will be remembered, after undergoing a thorough refit, sailed north in June last on its final voyage to open communication with the expedition, arrived at Sydney, Cape Breton, on September 16, bringing the leader and all his party in good health, in spite of the many dangers and hardships to which they have been subjected in their fight with the adverse conditions of the northern polar sea. The attempt to push northward over its icy wastes had been renewed during last spring; but though Peary's previous record of 1900 was passed by over half a degree of latitude, the advance had to be abandoned while still over 5° separated the explorer from his ultimate objective—the North Pole.

Before giving the details of the last season's work, so far as they have yet been made known by the telegraph, it may be of interest to briefly sketch the course of the expedition from its first start in 1898. Rarely has greater forethought been bestowed on the organization of an exploring expedition, the main outlines of the four years' programme having been laid down before the start was made, while the need of a system of communication with the advance party by means of yearly relief expeditions was recognized at the outset, and admirably provided for through the efforts of the explorer's supporters in the Peary Arctic Club. The *Windward*, presented for the purposes of the expedition by Mr. Alfred Harmsworth, sailed from New York in July, 1898, an auxiliary ship, the *Hope*, having sailed earlier with stores. The *Hope* returned from Etah, on Foulke Fiord, in August of the same year, while the *Windward* went into winter quarters near Cape Hawks, on the coast of Southern Grinnell Land. During the first winter the task of transporting the stores to the advanced base at Fort Conger was actively prosecuted, the leader suffering severely from frost-bite during the journeys made with that object. Geographical work of some importance was also done early in 1899 on the coast of Grinnell Land, where the series of fiords running into the land between Cape Saline and Cape Hawks was thoroughly explored, and the absence of a passage to the west demonstrated. During July of that year the first relief party sailed in the *Diana*, reaching Etah after a rapid passage, and returning with the *Windward* after handing over a fresh consignment of stores to the explorer.

The first attempt at a northward advance beyond the limits of the known was made early in 1900. The whole expedition was at Fort Conger in March, and a start was made along the North Greenland coast about the middle of April. As will be remembered, it proved impossible to advance beyond the latitude of 83° 50′ (itself a record for the western hemisphere), owing to the unfavourable condition of the ice, but valuable geographical results were gained through the charting of the whole coast of North Greenland to the neighbourhood of Independence bay, discovered by Peary during his land expedition of 1891–92. The winter of 1900–1901 was passed in the far north, and communication was therefore not effected with the *Windward*, which, after being thoroughly overhauled, had sailed in July, 1900, with fresh supplies, taking up also to the base at Etah the explorer's wife and daughter. The *Windward* wintered in Smith sound, whither Peary made his way in June, 1901, after an ineffectual attempt, in company with his servant Henson and one Eskimo, to again push north. The relief expedition of 1901, in the *Erik*, was met with in August, the two ships then returning south, and leaving the explorer prepared for a final dash north in the early part of the present year, while it was arranged that the *Windward* should once more sail north during the summer to convey the explorers back to civilization.

From the brief accounts yet received, it seems that the last winter was spent at Payer harbour, near Cape Sabine, where the *Windward* had wintered the year before. Here sickness broke out among the Eskimo, proving fatal to six adults and a child. They were at last replaced, and a start was made for Fort Conger in March, the final advance being begun from Cape Hecla on April 1, with Henson, four Eskimo, and six sledges. Lanes of young ice were constantly encountered, while as time went on open leads and floes in motion were met with, the pressure-ridges being also on a larger scale. Progress became more and more difficult, fogs being added to the other hindrances, and at last, in 84° 17′, a higher latitude than had previously been attained in the western hemisphere, the advance had to be abandoned. Cape Hecla was reached on April 29, and the return journey continued to Payer harbour, where the *Windward* arrived on August 8. Lieut. Peary is reported to maintain that ice-travel presents no greater difficulties in the extreme north than it does south of 80°, and that with a sufficiently advanced base—an impossibility in his case through want of adequate means—there should be no insuperable obstacle to an advance to the Pole. No land was seen north of Greenland, the northern coast of which is held to mark the beginning of the polar basin.

Though no startling discoveries have been made, the scientific work of the expedition is said to have produced valuable results, and the exhaustive study made by the leader of the Eskimo of the far north, a race whose habits are certain to be much modified in the future, is stated to be of great interest.

The system of relief expeditions organized in connection with Peary's undertaking has kept the civilized world fairly well supplied with information as to the course of the expedition, one season only, that of 1900, having passed without the arrival of news respecting the year's progress towards the final goal. Far otherwise has it been with the second expedition of which we have to speak—that of Sverdrup in the *Fram*—which has from the first depended on its own resources, and of the doings of which the news received during its four years' absence was exceedingly scanty. Since the autumn of 1899 we had, in fact, been in complete ignorance of the fate of the vessel and its crew, and it was only natural that a certain degree of anxiety had for some time been felt by the friends of the gallant explorers. This is now happily dissipated by the announcement, made only two days later than that of Peary's return, that the *Fram* and her crew had safely

reached Norway, after accomplishing much valuable work in the little-known region to the north of the American archipelago and west of Smith sound.

The return of the Baldwin-Ziegler Expedition by the Franz Josef Land route has been already recorded in the *Journal*, but some additional details have since been communicated to Reuter's agency by the leader, who has now reached this country. As the primary reason for his failure to reach a high northern latitude, he assigns the forbidding character of the ice in the archipelago during the autumn of 1901, which prevented the *America* from reaching a point far enough north to be of practical advantage as a base for the sledge-parties. A further serious obstacle was the sickening and death of many of the dogs from internal parasites, which ultimately proved fatal to nearly half the pack. Mr. Baldwin considers that good work has been done in the establishment of four large depôts, for which it was necessary to cover the same ground at least ten times. By the help of these it will now be possible to despatch parties from Rudolf Land without it being necessary to risk a ship in a higher latitude than that of Camp Zeigler. The *America* was set free on June 8, and this compelled the use of the reserve supply of coal at least six weeks earlier than had been anticipated, the ship being menaced by a fleet of drifting icebergs. The fifteen balloons sent up during the course of the expedition each supported a string of buoys containing messages, which would be automatically released on touching ice, land, or water. It is probable that the balloons have been driven on to the great field of ice which this year blocks the entire east coast of Spitsbergen, entirely preventing navigation in the western part of the Barents sea. Their recovery should supply valuable information respecting the currents of these seas. The homeward voyage of the *America* was a long-continued struggle with the ice.

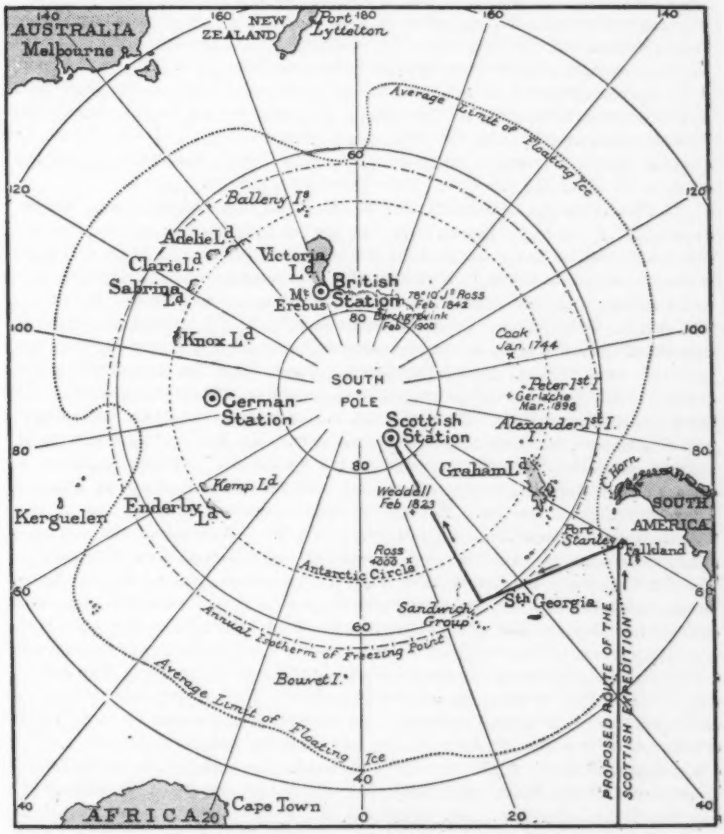
The expedition, Mr. Baldwin states, has yielded valuable results from a scientific point of view, especially in the direction of meteorology. The collection of photographs and kinematographs brought home is quite unique, while from a strictly geographical point of view, something has been done to increase our knowledge of the archipelago, the various channels having been repeatedly traversed in the search for a passage for the ship, while several new islands have been placed on the chart. Mr. Baldwin still believes in the possibility of reaching the pole by a sledge expedition from Franz Josef Land, and is proceeding to New York to consult with Mr. Ziegler as to the future plan of operations.

THE SCOTTISH NATIONAL ANTARCTIC EXPEDITION.

The object of the Scottish National Antarctic Expedition, which will start for the south at the beginning of October, is to specialize in oceanography and meteorology, and its sphere is to the south of the South Atlantic ocean, between the Swedish and German expeditions. It is proposed to reach as far south as is compatible with the attainments of the best results to science. It is not intended to allow the *Scotia* to be frozen in the ice. There are not sufficient funds for a wintering party. The plan will be to spend the first summer and autumn in the Far South, well within the limit of the ice, and there to sound, trap, trawl, tow net, carry on meteorological, magnetical, and general geographical observations. During the winter a retreat will be made to the north outside and up to the limit of the polar ice. If funds allow, a third cruise will be made during the second summer to complete the work begun during the first; and if more money can be obtained a wintering party will be left to carry on scientific investigation for twelve months. The expedition will be absent for about one to two years, according as the funds permit.

The ship of the Scottish Antarctic Expedition was formerly a whaler named the *Hekla*, now rechristened the *Scotia*. The vessel has been so thoroughly overhauled that she is practically reconstructed, and is as good as a new ship. This

work has been carried out by the Ailsa Shipbuilding Company, Troon, under the guidance of the eminent naval architect, Mr. G. L. Watson of Glasgow. She is a barque-rigged auxiliary screw steamer of about 400 tons, having a length of 140 feet and breadth of 29 feet, and drawing about 15 feet of water. With her new engines and boiler it is expected that a speed of fully 7 knots will be attained.



Sketch showing Proposed Route of the
SCOTTISH ANTARCTIC EXPEDITION.

The leader, the captain, and the scientific staff are accommodated in an after-deck house, the officers in a comfortable cabin amidships, whilst the crew are quartered forward in the fo'c'sl, which is not the least luxurious part of the ship. Simplicity has been aimed at, but at the same time necessities have not been neglected. The scientific work will be carried on in a deckhouse amidships, the after part of which forms the galley. Here there is good light for those who have to undertake delicate work, such as that with the microscope, hydrometer, and other delicate and finely graduated instruments. A second laboratory, mainly for

zoology, lies almost immediately below the upper one, 'tween-decks, and is reached directly from the upper laboratory. Adjacent to this is a compact and completely fitted dark room for photography. 'Tween-decks also will be found two great drums each containing 6000 fathoms of cable, each of which weighs 6 tons; this cable is led up on deck to a specially constructed forty horse-power steam winch, and from thence over the side of the ship by means of a derrick for the purpose of trawling and trapping in the greatest depths. The roof of the scientific deckhouse and its extension in the form of a bridge is where all the operations connected with the sounding and physical investigation of the ocean take place. Aft, on the poop, is the instrument which secures and hauls in, by a special motor engine, huge kites which suspend meteorological instruments at great heights in the atmosphere. This machine, as well as all the hydrographical machines, can also be driven by a special horse-power engine which is capable of hauling up instruments from the depth of the sea at the rate of 80 to 100 fathoms per minute.

The leader of the expedition, Mr. W. S. Bruce, has had an almost unique experience of polar exploration. He was one of the scientific members of the Dundee Expedition to the Antarctic in 1892–93; took part in the Jackson-Harmsworth Expedition to Franz Josef Land, and Captain Andrew Coats' Expedition to arctic waters; and has twice accompanied the Prince of Monaco to Spitsbergen. The captain of the *Scotia* is Captain Thomas Robertson, of Peterhead, who has had over twenty years' experience in arctic navigation, and made a voyage ten years ago to the antarctic regions. He has found the time and shown the interest which has enabled him to make important geographical discoveries, and has never lost a ship nor a man. The scientific staff, in addition to the leader, consists of half a dozen picked scientists, four senior and two junior men. Mr. R. N. Rudmose-Brown is botanist, and will investigate the small oceanic "plankton." He is a graduate in science of Aberdeen University, and is chief assistant to the Professor of Botany, University College, Dundee. He has also had experience at Kew, and in the British Museum under Mr. George Murray. Mr. R. C. Mossman is the meteorologist and magnetist. He has taken a course in magnetism at Kew Observatory. For fourteen years he directed the chief meteorological observatory in Edinburgh, and more recently one in Glen Nevis, and on several occasions has acted as superintendent at Ben Nevis Observatory. In addition he is the author of about fifty papers on meteorological subjects, the most notable being his monograph on the climate of Edinburgh in the *Transactions of the Royal Society of Edinburgh*. Dr. J. H. H. Pirie is geologist and medical officer. He is a graduate in science and medicine of Edinburgh University. He has worked at deep-sea deposits in the *Challenger* office under Sir John Murray, and has been trained in field-work with the members of the Geological Survey of Scotland. He served with the Imperial Yeomanry in South Africa with distinction, and was promoted to a lieutenancy in the Royal Field Artillery. Mr. Bruce and Mr. Wilton undertake the zoological work. Mr. Wilton has a wide experience of arctic life and work, having spent several winters in the north of Russia, which enabled him to become an expert ski runner and an adept in all that pertains to sledging. In 1896 and 1897 he joined the Jackson-Harmsworth Expedition to Franz Josef Land, and there assisted Mr. Bruce in the zoological work. Thereafter he returned to Edinburgh, studying at the University and Royal Colleges, attaining distinction in zoology and botany. During his vacations he has acted as an observer at the observatory on the summit of Ben Nevis, and has since taken part in an expedition to Turkestan and Western China, whence he returned with collections which materially added to our knowledge of the fauna of these countries. Two younger men will probably accompany the expedition as artist and taxidermist respectively. It is hoped that a bacteriologist will accompany the expedition.

REVIEWS.

AFRICA.

The Azores.*

This admirable study is divided into two main parts. Besides a general summary of *Notions geographiques sur les Açores*, a history of the discovery is given (subdivided into *La connaissance des Açores . . . jusqu'au XIV^e siècle*, *Les Açores sur les Portulans*, and *Découverte et Colonisation des Açores par les Portugais*), and an inquiry is added into the Flemish connection with this archipelago and its names of *Vlaemsche Eylanden*, *Insulae Flandricae*, *Iles flamandes*. The Flemish colonization at San Jorge and Terceira, and especially at Fayal, is specially examined in detail, and the story of a Flemish (pre-Portuguese) discovery of the Azores is discussed and rejected.

In an appendix valuable extracts, indispensable for a proper study of the subject, are made from the 83rd chapter of Azurara's *Chronicle of the Discovery and Conquest of Guinea* (A.D. 1445; p. 389 of Santarem's text), from Diego Gomez's extremely important and long-neglected *De inventione insularum de Açores*, and from the charters of Alfonso V. (July 2, 1439; March 10, 1449; April 5, 1443; April 20, 1447; January 20, 1453). A most useful comparative table is added of the Azores, as they appear in various Portolani, from the Laurentian or Medicean Portolan of 1351 to the George Calapoda of 1552.

The result of Dr. Mees' examination is greatly to discredit Father Cordeiro's *Historia Insulana*, on which almost all studies in the eighteenth and nineteenth centuries have been based. On the other hand, it is suggested that Diego Gomez, our only contemporary historian besides Azurara (who in this matter offers no decisive evidence), gives us the true account of the Portuguese re-discovery.

Now, according to Gomez, the islands of St. Michael, Terceira, Fayal, and Pico, together with a fifth unnamed, were apparently found, not in a series of ventures, but in a single voyage, by the enterprise of Prince Henry the Navigator, who desired to seek out lands beyond the furthest ancient limits. (*Tempore quodam* Infans . . . Henricus, cupiens scire partes extraneas Oceani occidentis, si invenirent insulas an terram firmam ultra descriptionem [P]tolomei, misit caravelas. . . .)

Martin Behaim's account, though loaded with inaccurate and misleading additions, is at bottom that of Gomez, and thus, so far as the discovery is concerned, preserves a truer record than Cordeiro. As to the year of the first Portuguese visit, and the name of the pioneer, Dr. Mees, in deciding between various readings of the famous inscription on the Valsequa (or Valsecca) portolano of 1434–1439, reads with Tastu, "*Aquestas illes foran trobades p. Diego de Sivilla pelot del Rey de Portogall an layn* MCCCCXXXVII." On the other hand, the Columbus Centenary Commission of 1492, under J. G. Imaz, appointed by the Spanish Government to examine and facsimile the Valsequa map, read ". . . *Diego Sunis . . . lany* MCCCCXXII." The damaged condition of this important legend makes the reading a matter of great difficulty and uncertainty; nothing is satisfactory here except a personal investigation of the original; it is of little use to study the discrepant reconstructions of others. Personally, we must confess a strong preference for the date-reading given by Pasqual, Rosello, and d'Avezac (MCCCCXXVII.).

As to the alleged grant of the Azores in 1466 by Alfonso V. to his aunt Isabel, wife of Philip the Good of Burgundy, Dr. Mees—surely with justice—

* 'Histoire de la découverte des Iles Açores,' etc., par Jules Mees (Gand, 1901), pp. 143, with reproductions of six maps of the Azores.

rejects it utterly. At most he only admits that the Duchess of Burgundy exercised a certain influence in the colonization of Fayal, the "Flemish island" *par excellence*, and that it was probably owing to her influence that Josse de Hurtere became the Captain Donatory of Fayal. Prince Henry's heir, the Infant Dom Fernando, may well have invited the co-operation of the duchess in settling this part of his inheritance, but he certainly did not divest himself of his rights in her favour. It is singular that Major, while attaching so high a value to Diego Gomez in reference to the Cape Verde islands, made so little use of his evidence as to the Azores. On the other hand, the mention of these islands in the *Conosçimiento* of c. A.D. 1330 has only been known since 1877; their occurrence on the Medicean or Laurentian Portolano of 1351 has long been known to, though strangely neglected by, scholars.

In reading this valuable essay of Dr. Mees', constant reference should be made to the comparative reproduction (at the end, on one sheet) of the Atlantic islands as they appear in the Dulcert of 1339, in the Laurentian map of 1351, in the Soleri Portolan of 1385, in the Andrea Bianco of 1448, in the Catalan map of the middle of the fifteenth century, and in the Soligo of 1455. In the first-named there is no clear evidence of the Azores; in the next five we can trace the slow cartographical development of the archipelago from the germ of the *insule de corvis marinis*, as given in 1351.

AUSTRALASIA AND MALAYSIA.

The Malay Archipelago.*

The Malay archipelago, through the fascinating beauty of its islands, lying in a blue pacific sea under the azure skies of the summer of the world, from the diversity of its flora, its fauna and its peoples with their varying manners and customs, and from the extensive regions within its vast boundaries which still await the gladdening eye of the explorer, presents attractions to the geographer, the naturalist, and the ordinary traveller which cannot be surpassed in any other region of the globe. Year after year it draws to its shores a succession of visitors of all sorts and conditions, and as a consequence we have a constant stream of works describing what of astonishment, delight, or instruction has been garnered by their authors in their wanderings in this wonderful region. We have a quartette of such books before us. Dr. Giesenhagen, the professor of botany in the University of Munich, visited the western portion of the Indian archipelago as a delegate from the German Government, to collect seeds and living specimens of such useful and commercially valuable tropical plants as would be suitable for the German colonies, especially gutta-percha, and to make himself conversant with their growth and cultivation, and to study certain botanical questions which could only be solved in their tropical home. His investigations led him naturally in the first place to the botanical gardens in Buitenzorg, then into West Java and the Preanger Regencies, thence to Sumatra, which he crossed from Palembang to Benkulen—one of the most delightful journeys which it is possible to take in the world (more especially, perhaps, if it is traversed in the reverse direction, when one can glide for days in a boat, or on a raft for preference, with, instead of against, the stream of the great rivers which traverse the wide eastern plain),—for Nature is encountered

* 'Auf Java und Sumatra.' Von Dr. K. Giesenhagen, A. o. professor der Botanik an der Universität München.

'Aus Insulinde: Malayische Reisebriefe.' Von Ernst Haeckel.

'Smaragdinseln der Südsee. Reiseeindrücke und Plauderein.' Von Dr. Alexander Pflüger, Privatdozent an der Universität Bonn.

'Nelle Foreste di Borneo: viaggi e Ricerche di un Naturalista.' Odoardo Beccari.

in every conceivable mood, virgin forests full of giant trees, lofty and picturesque mountains, active volcanic peaks, great rivers, pleasant cultivated regions, interesting people everywhere, and a land withal as safe as any part of Europe. From Benkulen Dr. Giesenhagen traversed the Padang highlands and Atjeh, and *viâ* Penang he reached the tobacco plantations of Deli, thence he returned with his collections to Europe. The same route was practically followed by the venerable biologist, Haeckel, who in 1890 undertook the journey to these Eastern Isles, for the purpose of collecting further observations on the marine plankton, so that he might bring to a completion the long and successful studies which he had devoted to these *Protista* for the great space of forty-six years. In his letters from *Insulinde* he gives a chatty account of his trips into various districts of Java (Buitenzorg, the Preanger Regencies, with its volcanoes and Hindu remains) and of Sumatra (the Padang lowlands and highlands). In the 'Emerald Isles of the South Sea,' Dr. A. Pflüger describes a *Rund-reise* in one of the steamers which periodically navigate the archipelago. Starting from Atjeh in northern Sumatra, he touched at all the important ports in most of the islands as far east as the "outposts" of German New Guinea; but the length of his excursions from the shore were limited by the duration of his steamer's stay in a port, which was rarely more than a night. The additions to our previous knowledge of the districts visited by these three travellers could, under the circumstances, hardly be expected to be extensive. Indeed, they specially disclaim any credit for original observations; but being men of superior culture their "plaudereien" are always interesting and suggestive. Prof. Haeckel's 'Reisebriefe' is full of personal reminiscences, sometimes rather discursive, and, as might be expected, it is elevated above ordinary books of travel by containing abundance of philosophic observations upon the men, animals, and plants which give interest and attractiveness to the scenery through which he passed, which delighted him by its unusual beauty. All three volumes are illustrated by specially fine process blocks from photographs or water-colour drawings, and by good maps. Strange to say, however, not one of them contains an index, an omission too common in German works, and unpardonable in an author nowadays. The cover of Dr. Griesenhagen's book is most appropriately ornamented with the batek-ed pattern of a Malay *sarong*, or petticoat.

To a far higher category appertains Dr. Beccari's 'In the Forests of Borneo.' Here we are presented with a concise and popularly worded narrative of that distinguished Italian naturalist's long and successful travels (for a short time in company with his friend Giacomo Doria) in that great and only as yet partially explored island, during the years succeeding 1865. The scientific results of his explorations, which have these many years placed the author in the first rank of the scientific men of Europe, and distinguished him as a field naturalist of the best type, have been described from time to time in his own special periodical 'Malesia,' and in other well-known scientific journals by himself or others. The present volume is Dr. Beccari's journal annotated with the fuller knowledge gained by the elaboration of his vast collections; it is practically a summing up of his long investigations. And as one would expect from a geographer and a field naturalist of his wide interests in and knowledge of nature endowed with the keenest powers of observation, we have a volume full of solid information charmingly conveyed, which we trust may ere long be translated into our own language for the benefit of a larger number of readers than those to whom it can appeal in its Italian dress. The appendices, by no means the least valuable portion of the book, deal with a general view of the virgin forests of Borneo, with the production of camphor, gutta-percha, indiarubber, and other vegetable

oils; gums, resins, aromatics and dyes, and also with the fruits and fibres which the island produces, finishing with the scientific descriptions of a large number of new Malayan and Papuan figs of the family of the *Artocarpeæ* collected by himself. The book contains an excellent index, and is full of illustrations.

H. O. F.

Torres Straits and Borneo.*

It will be within the recollection of many of the readers of the *Geographical Journal* that Prof. Haddon proceeded to Torres Straits in 1898, at the head of an expedition for the investigation of the anthropology of that region. Liberally endowed by the University of Cambridge, and assisted by the Royal Geographical Society and the British Association, the leader was able to secure a staff of colleagues, each of whom was specially qualified to undertake a particular line of research—some to devote themselves to the language and traditions of the people, others to their physical structure, and mental and sensory capabilities. The expedition was therefore equipped as no other, from England at all events, has ever been, for investigating a native race in all points which come under the designation of anthropology. The volume now under review, written by the leader of the expedition, and entitled 'Head Hunters, Black, White, and Brown,' is a general narrative of the journeyings of these white head hunters, and of some of the sights they witnessed and facts they gleaned—preliminary to a complete and detailed account which will follow in due course, which, it is not difficult to predict, will be worthy of their opportunities and their combined talents. The expedition, after completing its work in Torres Straits, in part crossed over to the New Guinea mainland, and finished by a visit to Sarawak in Borneo. The results of their studies among the Torres Straits islanders, to whom their mission was in particular directed, will be published by the Cambridge University Press as a series of special memoirs; while the observations collected in New Guinea and Borneo will appear in various scientific journals as opportunity offers. The first section of the volume deals with Torres Straits, and starts with the Murray islands. Work was begun by the establishment of a dispensary, where advice and medicine were gratuitously given by the medical members of the expedition, whose patients were deftly allured as subjects into the adjoining psychological and metrical laboratories, where, through their complacency and conscientiousness in performing the tests set them, a large number of valuable records were obtained. The expedition gave special attention to the investigation of the initiation mysteries for the formal reception of the lads into the community of men, which, in the Murray islands, is known as the *Malu* ceremonies; and of the *zogos* or divination shrines and sites of powerful charms. In Murray island true totemism does not now seem to exist, but there is an important brotherhood, and into it the *Malu* ceremonies gave admission. Through his well-known sympathetic fellowship with all humans, and his genial camaraderie, our author possesses a wonderful power of eliciting the confidence and reaching the inner workings of the minds of native races, a qualification which it is impossible to overrate in one charged with the sort of investigations he had set out to make. With infinite pains Prof. Haddon succeeded in recovering, when all but too late, from the fading memories of the few remaining old men—for the young men know nothing of them—the main facts of these forgotten ceremonials and old-time fashions of a primitive stage of their culture. The *Malu* ceremonies took place, sometimes at

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* 'Head Hunters, Black, White, and Brown.' By Alfred C. Haddon, Sc.D., F.R.S. Methuen.

all events, at the *zogos* or shrines hidden away in secluded spots in the bush, which consist of collections of stones specially arranged and named, upon which divination is accomplished by the voices and movements of birds, lizards, insects, or the appearance of natural objects in relation to the stones. Dr. Haddon succeeded in having the long-neglected sites, with their stones, shells, and monumental figures, cleared of the vegetation in which they had become quite buried, and by various artifices inducing the old men—after overcoming their natural reticence in divulging before strangers these solemn rites—to go through the ancient ritual and ceremonial of their creed, with the sacred objects, paraphernalia, and costumes (remodelled for the occasion to the best of their recollection), so that as complete an account as is perhaps now possible has been photographed and placed on record. The full details of these mysteries will be awaited with impatience by all interested in the evolution of brotherhoods, totem-clans, and religious observances. In the islands of Kiwai, Mawatta, and Saibai, in Mabuiag, lying in mid-strait, and in some half-dozen other western islands subsequently visited, a totemistic stage of culture was found existing, which provided the expedition with the opportunity of making important contributions to this very polemical subject, towards the elucidation of which a great deal in late years has been contributed, with much deep insight, by Dr. Frazer and Prof. Baldwin Spencer, whose theory that totemism is an economic custom receives some corroboration from the facts collected by this expedition in the island of Mabuiag especially.

The second part of this book gives a chatty narrative of the trip undertaken by Dr. Haddon and his colleagues Ray, Seligmann, and Wilkin along the Papuan coast, with their by-excursions into the interior to as far south as Hood peninsula. The ground here was already harvested considerably by himself and previous observers, so that fewer lines of inquiry were left virgin for them; still, they give us, among other subjects, detailed descriptions and some illustrations of the figures of many of the dances of the tribes they visited, and of the games and toys of their children, which are additions to our knowledge.

A large third section of the 'Head Hunters' is devoted to a description of the experiences of the members of the expedition who visited Borneo at the invitation of Dr. Hose, the Resident of Baram in the Sarawak Government, under the sanction and with the interest and help of its ruler (Sir Charles Brooke). Dr. Hose, who has resided long in the country, possesses an unrivalled acquaintance with its languages and ethnography. His happy association with Haddon and his colleagues could not be but of the highest value and importance to the investigation of the numerous ethnographical problems that require solution in Borneo. Hose and Haddon, as ethnologists congratulate themselves to learn, purpose to deal conjointly with this interesting subject at some length in a memoir elsewhere. Dealing with it on broad lines, our author believes that the whole of Sarawak was inhabited in the earliest times by a weak agricultural people, now represented by a number of tribes who may for the present be regarded as indigenes, and for whom he and Dr. Hose propose the collective name of *Kalamantan*—a mixture of narrow-headed Indonesians and broad-headed Proto-Malays, with an infusion of early immigrant Philippine and "Indo-Javan" blood (or, as we should prefer to say, "Indo-Malayan," for the Javanese are really a Hindu+Malay, if not a Hindu +Malay+Indonesian complex). The nomad forest-dwelling Ukits and Punans are a further indigenous race, whose description reminds us very strongly of the Kubus of Sumatra. Among these is found a foreign element, first of all in the Kenyahs and Kayans—a comparatively recent immigration, whose good physique and firm social organization have given them an advantage over the original natives of the soil; next in the Sea Dyaks (for whom Haddon proposes the definite

scientific term *Iban*), who probably belong to the same stock as the original Malay, whose "immigration may be regarded as the first wave of the movement that culminated in the Malay empire;" and lastly, in the Malay or piratical element, who, themselves keen for slaves and booty, allured probably the Iban to join them "for the sake of glory" and the reward of the heads of the slain, for the accumulation of which they have long shown such a special passion—the Iban being the head-hunters of Borneo *par excellence*. This combination of Iban and Malay it is which is generally but inaccurately spoken of as the Sea Dyaks. It is an interesting fact, as Haddon notes, that the decorative art of the Iban men "is entirely distinct in motive and style" from that of their women. May not this suggest an exo-Iban influence to which the men have given way, while the women's patterns belong to the old-time fashion of their people? Prof. Haddon, personally conducted by Hose, was enabled to witness the ceremonies attending many of the remarkable superstitions in various districts of Sarawak, the details of which he has succeeded in recording and sketching. "The Omen Animals of Sarawak" and "The Cult of Skulls" occupy two chapters full of original observations. The cult of omens the author believes to be indigenous to Borneo, but unconnected with totemism, and head-hunting he thinks is a comparatively recent institution—in Hose's opinion not over two hundred years old. Space forbids us to refer to many other tempting topics.

Altogether, this volume, which is illustrated by many excellent process-blocks from photographs taken chiefly by Mr. Wilkin, who, to the great regret of ethnologists, has not survived to see the fruits of his labours, is full of interest, and whets our appetite for the special memoirs promised us in due course.

H. O. F.

The Geography and Geology of Celebes.*

This volume is the fourth of the great monograph by the brothers Sarasin, on the natural history of Celebes, one of the most beautiful, and, from the point of view of its geographical configuration, one of the most remarkable islands of the Indian Archipelago, as it is one of the most important, in regard to its position and biological history, in the region. The first two volumes were a necessary preliminary to an understanding of the third, and now a study of all the three must be a preliminary to the complete comprehension of the present beautifully printed and sumptuously illustrated book, which deals with the geography and geology of the island, to the real history of which it is a notable contribution. An orographical map, which is a very fine specimen of cartographical skill, supplies all that is needed, as well as makes it easy and pleasant, to follow the descriptions given in the text. It was the authors' intention to have provided a geological chart of the island as well, but their attempt had regretfully to be abandoned, for they found, as the work progressed, that the results would be in many places entirely hypothetical, because the regions of the island from which as yet not a single rock is known are still numerous. The geology of Celebes must, therefore, be followed from the text alone.

The authors describe in special detail the northern arm of the island, in which lies the most interesting and admittedly the most beautiful region of the Minahassa with its numerous volcanoes, devoting, indeed, more than half of the book to it. Then in succession are described the several peninsulas, which, like the spokes of

* 'Materialen zur Naturgeschichte der Insel Celebes. Band iv.—Entwurf einer Geographisch-Geologischen Beschreibung der Insel Celebes.' Von Dr. Paul Sarasin und Dr. Fritz Sarasin.

a revolving svastika, this extraordinarily shaped island throws out. A study of the map gives us, almost for the first time, a clear idea of the surface features of the island, and reveals many geographical characteristics which have hitherto been unrecognized. Celebes is seen to be ploughed into a series of parallel ranges, lying in a nearly north-and-south direction, which in the neighbourhood of the equator have been deflected at an abrupt angle towards the east. Between these parallel ranges lie more or less extensive plateaux, or wide valleys, traceable the whole length of the island from the northern to the southern sea, uninterrupted by few if any cross-spurs. In these valleys are situated a series of remarkable lakes, fed by rivers flowing in a north or south direction, whose waters reach the sea on the east or west coasts through breaks in the chains. The great gulfs of Tomini and Tomaiki are seen to occupy depressions within the converging arms of the easterly curving ranges, and in the very acute angle of the latter is to be noted a fracture of the more easterly ridge, allowing an inroad of the sea; also, along the abrupt outer or western curve of the main parallel ranges which traverse the length of the island, the westernmost suddenly breaks off (as if it had disrupted in the bending), and gives place to a much denudated coast, bounding a low foreshore till where the hills turn eastward it reappears and continues as the northern, east-to-west-trending ridge of the island. Across the elbow of the right angle—over which the equator passes—occurs the narrowest portion of Celebes, and the only place where there exists no high land, so that one can travel from sea to sea without encountering more than gentle undulations of the surface. The shorter eastern chains traversing central Celebes from north to south appear to be only stumps of what they once were. One is also struck, on a study of the map, by the fact that no volcanic cones exist along the mountain chains, several of whose summits reach over 5000 feet, except at the extreme ends of the two longer ranges of the western side, where their arms diverge in the Minahassa and the Macassar regions. The Minahassa cone-cluster extends from the Klumbangan river eastwards to the land's end, and culminates in the Klabat, 6600 feet in height; while at the southern extreme of the double range the peak of Bantaeng, "a stupendous volcanic block, in size and extent not inferior to Etna," covered with parasitic cones, dominates the landscape as the voyager approaches Macassar, being seen, as is the Klabat, from a great distance at sea. No serious eruptions are recorded from these centres in very recent times, except from Una-Una, a small sea-encircled crater in the Gulf of Tomini, which in the violent outburst of 1898, lasting several months, discharged enormous quantities of ashes, which covered the ground to a depth of several millimetres as far off as Donggala, several hundred miles distant on the west coast.

The remarkable lakes we have referred to above lie, as has been said, in the hollows between the parallel ranges. The larger and more interesting are those situated between the two long western chains, which, but for the solution of continuity in the more westerly one, along its elbow, would form a continuous trough from Macassar to the Minahassa, namely, Lakes Limbotto, Lindu, and Tempe; and in the wider but shorter depression, stretching from the Gulf of Tomini to that of Bone, lie the Posso, Mantana, and Towuti "seas." These lochs seem to occupy old sea-bottoms now dammed off from the ocean once inundating the synclinal troughs, or lie in deep clefts there along lines of fault parallel to the ranges. In the former cases subsequent sinking of their floors has prevented them from becoming filled up by the alluvium brought down by the rivers. Several of these lakes are of great depth, Posso being nearly 1000 feet and Motana over 1500 feet. The mollusca collected from them by the Sarasins and described in their first volume are of particular interest in presenting a Tertiary facies, some of the *Melaniidæ*, indeed, having very close affinities with those of the European

Miocene. In this respect they resemble such "Grabenversenkungen" as Tanganyika and other lakes in the Rift-valley of Africa.

The geological formations represented in Celebes, so far as brought to light by the investigations of the Sarasins and others—for our authors have most carefully collated all the recorded observations of the various travellers and investigators in the island, with due credit to each—appear to be, beginning with the lowest, sandstones and crystalline schists, over which lies a massive deposit of Red Clay (probably assignable to the Cretaceous), whose included *Radiolaria* indicate its deposition in a deep sea. The authors note as remarkable that they found no certain traces of the Jurassic formation, which is well displayed in the neighbouring Sula islands, but it is its occurrence there which has induced them to speak hypothetically of the granular crystalline limestone found in the central ranges of Celebes, as perhaps dynamically metamorphosed Jurassic limestone—a fragment of the Chino-Australian Jurassic continent of Neumayer, of which the islands of the Malayan archipelago are the disrupted fragments. Over the Red Clay and beneath the Eocene nummulite limestone occur coralline beds, whose presence points to a continental condition of Celebes, which the Sarasins think may have endured to the beginning of the Tertiary period. The deep pre-Eocene sea which filled the region which the island now occupies, gradually shallowed and became filled with nummulitic and coralline limestones. Upon these repose beds of sandstone and conglomerate (a formation to which the authors give the name of *Celebes Taveyannaz*), and also those which they designate as 'Molasse,' containing marine, brackish, fresh water and land remains, all of Miocene age. The elevation which began at the close of the Eocene resulted, during the Miocene, in the upheaving of the mountain systems we now see in the island, and as a consequence in the outbreak of volcanic action, the outflow of lavas and ashes, and the formation of intrusive dykes. The latter are most carefully described in an appendix to this volume by Dr. Schmidt. This elevation continued during the Pliocene, when the area of Celebes attained its maximum, which was again reduced during the Pleistocene by subsidences.

The remarkable configuration of Celebes has attracted the attention of all who have visited it or studied the geography of the region, and its great similarity to Halmaheira has not escaped observation. The Sarasins, discrediting the idea that the form of these islands can be accidental or a mere sport of nature, suggest a mechanical explanation, similar to that proposed by Suess for the Alpin-Appenine system of Europe, for the peculiar trend of the mountain chains of these two islands, namely, two antagonistic vortices sliding beneath each other, the inner *against* and the outer in the *direction* of the hands of a watch.

Altogether this extremely able, interesting and suggestive volume, is a contribution of the highest value to the history of this part of the Indian Archipelago. We note with regret, however, that, like so many German works, it is not provided with an index, which, in a volume which must always be a work of reference, is a great and serious shortcoming.

H. O. F.

POLAR.

Voyage of the "Belgica." *

In his eloquent preface M. Reclus pays a tribute to the modesty and self-effacement of M. de Gerlache in his expedition, the preparations for which, it would

* 'Voyage de la *Belgica*.' Quinze Mois dans l'Antarctique par le Commandant de Gerlache. Préface par Elisée Reclus. Paris: Hachette & Cie. 1902.

appear, has occupied his thoughts and formed the aim of his endeavours for many years.

The book itself commences with a short summary of previous expeditions from the time of Dirk Gerrtsz, and an account of the efforts made to organize the *Belgica* expedition and raise the necessary funds. The narrative of the voyage occupies the rest of the volume, and this gives in a popular form an excellent account of the events and incidents of the first expedition wintering in the antarctic regions. Perhaps it makes too little of the discomforts and hardships, but that after all is a venial fault. The book is written in excellent taste and spirit, and the author succeeds in making his narrative popular without being flippant, and serious without being dull.

The illustrations are not altogether trustworthy "documents," for a good many of them are photographs which have been improved upon by the artist, and some, especially the portraits, are only "after photographs," and leave a great deal to be desired.

The facts regarding the memorable cruise of the *Belgica* are so well known to our readers that it is unnecessary to repeat them. It is satisfactory to have at last what may be looked upon as the authoritative account of the cruise; but, of course, the great monument of the expedition will be the magnificent series of memoirs now being published at Brussels, dealing comprehensively with all the collections and observations.

THE MONTHLY RECORD.

THE SOCIETY.

Honour for the President.—The following communication has been received by our President, Sir Clements Markham, from the President of the Peruvian Commission of Fluvial Highways; it is dated, Lima, July 15, 1902:—

"The Committee over which I preside, in the fulfilment of the high charge with which it has been entrusted by the Supreme Government, has believed it to be a duty to give a testimony of cordial esteem and sympathy to you, by conferring the name of *Port Markham* on the place where steam navigation commences on the river Tambopata, which has now been reached for the first time by a Peruvian Commission, and where a station has been established. Your name is thus connected with one of the richest zones of Peru, which has merited so much interest from studies by which we set a high value.

"At the same time I have pleasure in announcing to you that the station formed at the mouth of the same river Tambopata, where it unites with the Madre de Dios, has been named *Port Maldonado*, as a tribute to the memory of the late Colonel Don Faustino Maldonado, who, as you are aware, was the modern discoverer of the great river Amarumayu."

EUROPE.

Distribution of Fog in Switzerland.—The results of a detailed study of the conditions attaching to the prevalence of fog in Switzerland, somewhat on the lines adopted for Germany by Hugo Meyer and for Great Britain by R. H. Scott, have been put forward by Gottfried Streun in a dissertation for the degree of doctor in the University of Berne. The author discusses in much detail the distribution of fog in Switzerland, both in time and space, as well as the relations between the general condition of the weather and the occurrence of fog. Some of the broader generalizations only can here be referred to. In the region of valley-fog the morning is the time when the phenomenon is most marked, owing to the nightly cooling of the ground and the superincumbent atmosphere; while in the case of mountain-fog, the frequency of occurrence is distributed pretty evenly through the hours of the day. In the lowlands, again, a clearly marked yearly period is to be traced, while with an increase of altitude this becomes less and less recognizable. The maxima and minima fall at somewhat different times of year in different parts of Switzerland, though at the lower levels the maximum occurs with more or less regularity towards the close of the year (most frequently in November). Already at about 1000 metres the yearly period loses its well-marked character, both valley and mountain fog here occurring side by side. In the higher valleys the maximum occurs in October, and the minimum in winter, while on mountain summits two very slight maxima can be traced in May and October. Dr. Streun gives maps showing the distribution of fog in space, both for the year as a whole and for the summer and winter half-years, as well as a series showing in detail the distribution at short intervals during the autumn of 1897. In the region below 1000 metres, with which alone the maps deal, the greatest frequency of fog occurs in the central lowland, a zone with over fifty days of fog in the year running along the foot of the first chain of the Jura, with a width of about 15 to 20 miles. On the other hand, fogs are least frequent in the deep Alpine valleys, both in the north and south, which show generally less than twenty days of fog in the year. This is in part due to the influence of the Föhn. Other points touched upon are the average duration of individual periods of fog at different stations and at different seasons, and the average altitude of the upper limit of fog, with its variations at different hours of the day.

The Tectonic Relations of Crete.—We have already referred (*Journal*, vol. xix. p. 212) to the scientific expedition undertaken by MM. Ardaillon and Cayeux for the study of the physical geography and geology of Crete. The researches of the French savants are of special interest from the small amount of definite knowledge previously possessed as to the structural lines of the island, and from the fact that, according to the tectonic theories of Suess, Crete would lie on the course of the great Dinaro-Tauric arc of that geologist. Suess supposed that, as in parts of Greece, the structural lines of the island ran from west to east, and that it thus formed with Cyprus a connecting link between the Dinaric chain and the Taurus. In the *Comptes Rendus* of the Paris Academy of Sciences (vol. 134, No. 20), M. Cayeux points out the extent to which the researches of himself and M. Ardaillon tend to modify the conceptions of Suess. In Western Crete, the part of the island examined by them last year, no trace of an east-to-west direction was discovered, the peculiar promontories running from south to north in this section being, in their view, the northern terminations of anticlinals of which the western versant has invariably collapsed, giving the headlands their characteristic asymmetry. This state of things does not, apparently, extend very far to the east, but even if the Dinaric system can really be traced in this direction, it is

maintained that an important branch must certainly run in an almost opposite direction, through the extreme west of Crete. This would seem in any case to be connected with the African continent, though whether it there maintains a south-westerly direction, or whether it continues to curve until it finally assumes an east-to-west direction, must be left to future investigation to decide.

The Topography of the Vienna Forest and Basin.—The latest addition to the series of classical monographs known as 'Penck's Geographische Abhandlungen' is a volume on the recorded variations of topography in the Vienna forest and basin, by Dr. Alfred Grund. The precise limits of the area dealt with are: west, the Traisen; north, the Danube; east, the political frontier; south, the Schwarza, the Semmering, and again the frontier to the Salza. Accepting the fact that changes of surface-form due to purely natural causes, and variations of climate, may be taken as of negligible amount within historic times, Dr. Grund begins with two descriptive chapters—one on the structure and surface of the district, and another on the climate. These are models of what such chapters should be; they aim at setting forth the facts of physical geography so as to describe the conditions presented by the region for cultivation and settlement, leaving questions of development and cause to the geologist and meteorologist. Next follow the main sections of the work on the topography and the changes in the topographic picture during the middle ages. These occupy more than one-third of the whole book, and the two together form an exhaustive investigation, by historical methods, into the relation between the physical conditions of the district and its population in the earlier stages of colonization, the main object being to separate out conditions due to the original environment from conditions induced by colonization itself. The discussion is chiefly based on analysis of the forms of settlements—isolated units (*Scottice*, "touns"), hamlets, villages, etc.—and of the structure of dwellings, the well-known work of the Austrian anthropologists being utilized. A number of types is recognized in each case; these are correlated with each other, and the distribution brought into line with the historical and ethnographic boundaries. It is impossible to give here a detailed account of Dr. Grund's laborious investigation, a splendid example of the power of modern geographical methods when employed with proper attention to detail in matters of fact. Suffice it to state some of the general conclusions. (1) The form and position of settlements (*Ortschaften*) are the fundamental and constant factors, their size and number the most important variables. (2) Where the physical conditions are unequal, the position, size, number, and form of the settlements are determined by these physical conditions and by the race of the settlers conjointly, the former deciding specially the positions and the latter the forms, while the influence of both in determining size and number is about equal. (3) Where the antecedent physical conditions are the same, differences in position, size, number, and form of settlements are to be accounted for by historical causes, or by differences in the place of origin of the race of the settlers. Such regions are valuable in affording an opportunity of estimating the effects of the action of these influences by themselves. (4) The size of individual settlements varies inversely as their number and directly as the populousness of the region. Small villages have a relatively large number of settlements, but small population; hence large settlements widely distributed indicate a relatively large population. But it is to be observed that the law holds good only in agricultural districts, and not in industrial regions or on lines of communication. In these latter the populousness is independent of the number of settlements, but varies directly as their size. (5) The structure of dwellings and settlements is a joint product of the community and of the surroundings. The prevailing ethnographic

element in the population determines the type of dwelling, except in so far as types belonging to an earlier colonization are retained. In general, the type becomes modified by the superposition of new forms upon the old. (6) For the reason just stated, the types of dwellings can only be employed in identifying ethnographic units to a very limited extent, and the greatest caution must be exercised. (7) The number, size, and populousness of agricultural settlements is subject to regular oscillations following a definite law. (8) These oscillations depend on the variation in productiveness of the region, the curves ascending to a maximum and descending to a minimum at times of greatest and least productive value in the land. (9) Periods of great productiveness are periods of artificial topography (*künstlicher Landschaftsbilder*) in which man, intentionally or unintentionally, veils the face of Nature. During minimum periods, on the other hand, Nature reasserts herself, and favourable or unfavourable conditions of soil and climate become of greater relative importance. (10) The fluctuations of industries are in the opposite direction; minimum productiveness means a maximum of industry involving hired labour, and the size and populousness of settlements increases, although their number remains the same.

ASIA.

Overland Journey from the Persian Gulf to Maskat.—Major Percy Cox, H.B.M. Consul at Maskat, writes to inform us of a successful journey made by him in May last from Abu Thabi, on the pirate coast of the Persian gulf, overland to Maskat through the interior of Oman. He hopes to send later some notes on the journey for publication in the *Journal*, and meanwhile gives only a brief indication of the route followed. From Abu Thabi, which was reached on board a gunboat, he struck east for Bereimi (shown on Mr. Zwemer's map in the *Journal* for January last), meeting on May 14 Rashed, Wali of Semail, a man of much influence with the tribes, who had been sent overland by the Sultan to meet him. The route seems to have then turned south-east across the Dahera, passing through Dhank (perhaps the Danj of Zwemer), Ibri (evidently the Obri of Wellsted, the terminus of that traveller on his way inland from the east coast) to Gabrin and Bahla, also visited by Wellsted early in the nineteenth century. Hence Major Cox struck east or north-east to Nezwa and Tanuf, on the southern side of the Jebel Akhdar, or Green mountain (cf. Colonel Miles's paper in the *Journal* for November, 1901). This range belies its name, being, like the rest of the country, absolutely desert, apart from a few well-watered spots. After some difficulty the permission of the Beni Riyan to cross the mountains was obtained, and Major Cox visited the elevated villages of Saik and Sheraizi (see Colonel Miles's map), where the temperature was found to be unpleasantly cold after the burning climate of the plains. Descending on the northern side of the range to Meti, the traveller continued his route to Maskat *viâ* Semail, reaching the former place on May 29.

The Navigation of the Tigris.—The navigation of the Tigris, the chief means of communication which Baghdad has with the outer world, is stated to be growing increasingly difficult. This is partly owing to neglect of dredging operations, and partly to the unchecked habit adopted by local agriculturists of cutting irrigation channels and primitive canals in various unscientific ways, and thus causing the river to silt up or widen out into broad shallows at difficult places. The insufficiency of the steamer traffic, in the opinion of Major Newmarch, our Acting Consul-General, is also largely responsible for the unpromising condition of affairs. He points out that with due attention to these points the trade of Baghdad and the neighbouring districts would be considerably increased, and the

country developed to an extent which would amply repay the expenditure incurred.

The Orenburg-Tashkent Railway.—The railway from Orenburg to Tashkent, though projected two years ago, has only recently had its exact direction determined. It will run from Orenburg southward to Tletski Zashita, and thence in a south-easterly direction past the northern shore of the Aral sea to Kazalinsk on the Syr Dari. Continuing along the valley of that river through the towns of Perovsk, Julek, and Turkestan, it thence bends somewhat to the east and passes through Chemkent to its terminus at Tashkent. The whole distance to be traversed is 1160 miles, and the line is mainly strategic in character. The cost of construction is estimated at £13,000,000, and the work is to be completed ready for traffic by January 1, 1905.

AFRICA.

Scientific Expedition to Algeria and Tunis in 1731.—Dr. Martin Grosse, of Leipzig, has recently called attention, in the *Mitteilungen* of the Geographical Society of that city, to an expedition sent out to Algeria and Tunis in the early part of the eighteenth century, which has hitherto been somewhat overlooked by students of the historical geography of Africa. Its promoter was Augustus the Strong, Elector of Saxony, who in 1731 despatched the German *savant*, Johann Ernst Hebenstreit, with five European companions, to North Africa, for the special object of scientific research. To it, therefore, in Dr. Grosse's opinion, belongs the distinction, assigned by Vivien de St. Martin to Niebuhr's expedition sent out thirty years later by the King of Denmark, of being regarded as the pioneer enterprise in the field of scientific exploration. In spite of the important part played by North Africa in the early history of the Mediterranean, the Barbary States were, at the opening of the eighteenth century, virtually unknown to Europeans apart from their coast-line, with which the nations of Europe had been brought into contact by the long-continued struggle with the Corsairs. Four names stand out among those of lesser travellers of the period, to whom were due the first steps towards an improved knowledge—the Englishman Thomas Shaw, the Spaniard Francisco Ximenes, the French *savant* Peyssonnel, and the German Hebenstreit; and amongst these the last-named, and his companion Christian Gottlieb Ludwig, occupy a somewhat special place as members of an expedition organized on a large scale, instead of travelling alone and on their own account. Hebenstreit's letters were published in part in 1783, while extracts from the remainder (which dealt with the more important part of the journey) were first made public in 1865. An instructive narrative, written by Ludwig, has only lately been discovered, and entitles its author to rank with the other four investigators alluded to. Dr. Grosse gives biographical sketches of both Hebenstreit and Ludwig, and describes their journeys in considerable detail, as far as possible in the words of the explorers themselves. He also gives a map, in which he lays down their various routes, so far as they can be traced with certainty or probability.

Surveys in South Africa.—The recently issued report of the astronomer at the Cape for 1901 records the extension of the geodetic arc of the meridian to the Zambezi during the year. Many difficulties were experienced in the prosecution of the work, and the short observing season, which lasts only from March to July, came to an end before the programme had been entirely completed, with the result that two or three stations south of the Zambezi still require to be occupied with the geodetic theodolite. In the interval between the observing seasons of 1900 and 1901, the wires used for measuring the base near Salisbury were re-compared at the Royal Observatory, the measurement of the angles from the Salisbury (Gwibe) base

to the main triangulation was completed, and signals were exchanged for the longitude of Salisbury. The operations northward from the Zambezi will be organized from Chinde as a base. The survey of the Anglo-German boundary in South-West Africa has made steady progress, both by triangulation in the field and by the reduction of previous observation, while the beaconing of the boundary south of Reitfontein has been commenced. A more accurate determination of the 20th meridian than had been previously made was effected, the result being to place the point taken by Bosman to represent that meridian in 19° 59′ 58·94″, a difference of only 1″·06. The whole of the field operations have been rendered difficult by the flat and arid character of some parts of the country, and the wood and bush met with in other parts.

AMERICA.

The Physical Geography of the Red River Valley.—A paper on this subject by D. B. Dowling, B.SC., which first appeared in the *Ottawa Naturalist*, vol. xv. No. 5, has been reprinted as a pamphlet, illustrated by two maps. Mr. Dowling points out that the Red River valley, the hills bounding it on the west, and the rugged plain on the east, are three distinct regions, which primarily owe their special characteristics to the various geological formations of which they consist. A study of these deposits has convinced Mr. Dowling that at any rate part of Manitoba had been twice submerged beneath the sea, and finally elevated before the glacial period. The ice then gradually travelled southwards, till it completely filled the Red River valley and even extended over Minnesota. As the ice melted, a large lake was formed along its southern margin, which increased in extent as the ice retreated northwards, and beaches were formed along its shores. The lake was at first drained southwards to the Mississippi, but later "the water found other outlets, probably towards Hudson bay, and a gradual contraction of the lake ensued, in which successive beaches mark the different stages." These beaches are indicated on the map of part of Manitoba which accompanies the paper. The present lakes of Manitoba are the remains of this great lake of former times, through whose waters the boulder clay and other sediment falling in large quantities into it must have been constantly sifted and distributed over the district, thus causing the wonderful fertility which characterizes most of the Red River valley.

The Klamath Mountain System in the Western United States.—The name Klamath mountains has been given of late years to a number of ranges in the Western United States which have been thought deserving to be distinguished from the Sierra Nevada and from other coast-ranges. Geologically, they are known to resemble the Sierra Nevada in the age and character of their formations, but they are separated from that range by the broad structural valley of the Sacramento, the upper course of which, with the Rogue river, bounds the group on the east. The Klamath mountains have hitherto been regarded as forming a *complex* without any definite order, but in a recent paper in the *Journal of Geology* (vol. x. No. 2) Mr. F. M. Anderson endeavours to show that a certain general system exists in their arrangement that has hitherto escaped notice. In his opinion they may be classed into two main systems, which he believes to have a definite relation to the dynamical history of the region. These two systems cross each other nearly at right angles, the most conspicuous ranges, including the Rogue river, Siskiyou, Scott, and Trinity mountains, running westerly or south of westerly, while many of the less important ridges follow a northerly or north-westerly direction. Some of the east and west ranges may be traced right across the Cascade range, and they evidently represent axes of structural development that

are very old as compared with others in the same region. Although their east and west course has had a controlling influence on the greater drainage, it is possible also to recognize the effect of the north and south lines of folding on the structure of the country as seen in the trend of the ranges and the courses of streams. The principal north and south fold coincides with the Salmon river range and its continuation north and south. It crosses all the principal rivers in a way which demonstrates its comparatively recent age, the streams having developed deep and narrow cañons through it during the course of its gradual elevation. The resulting type of valley is characteristic of the region. Mr. Anderson describes what he considers to be the general course of the geologic history of the Klamath mountains, in which he finds evident traces of an elevated peneplain at an altitude of 4000 or 5000 feet. It is to be referred to degradation during the Cretaceous and Tertiary periods, but has been subjected to disturbances, giving rise to the features above alluded to. The question of the existence of remnants of an old peneplain in the Klamath region is also discussed by Mr. O. H. Hershey in a preliminary note in *Science* for June 13, fuller treatment being reserved for a paper to be published elsewhere. This peneplain is localized by the writer in the Trinity basin, in the neighbourhood of the Sierra Costa mountains, at an altitude of about 3800 feet, and it is regarded as the equivalent of the late Tertiary peneplain of the Sierra Nevada region.

Portland as a Trade Centre.—The development of Portland, Maine, has of late, judging from our consul's report, been remarkable. With 40 feet depth of water at low tide, vessels of any tonnage can lie in the harbour. The port is served by six great steamship lines—the Dominion, Allan, Elder-Dempster, Hamburg-American, Thomson, and Leyland Companies—and the city, being the terminus of a like number of railways, taps a vast extent of country. The products of Canada, British Columbia, and Manitoba are brought hither by the Grand Trunk, and much grain and cattle from the Western States. Some thousands of cars are needed to cope with this Western and Canadian traffic, and it is stated that at times the Grand Trunk yards in Portland have cars enough standing to make a continuous train 15 miles in length. Two enormous elevators, the largest on the Atlantic coast, one with the capacity of 1½ and the other 1¼ million bushels, deal with the grain, and it is said that during last winter these were taxed to the utmost. Attention is drawn to the great advantage that reciprocity with Canada would be to both parties concerned, and the Portland Board of Trade has now taken up the question with the hope of bringing this important measure to a successful issue in the near future.

Glacial Work in the Western Mountains.—The *Journal of Geology* contains a short account of studies of Pleistocene problems in the western mountains of North America, carried on by the U.S. Geological Survey during 1901. Four small parties, under the general direction of the writer of the notice, Mr. Rollin D. Salisbury, were in the field; and of these, three devoted themselves to detailed study of selected areas, with the view of ascertaining the general conditions of glaciation at a number of widely separated points. It is expected that "when a sufficient number of selected areas have been studied similarly, the results will afford a basis for preliminary conclusions concerning the course of Pleistocene history in the western mountains, and will be helpful in guiding future work." Mr. Salisbury spent about six weeks in the region; one party was in north-western Montana, east of the Rockies; one farther west, on the western side of the Rockies, in north-western Montana, northern Idaho, and eastern Washington; one in the Wasatch mountains; and one in the mountains of New Mexico, a few miles north-east of Santa Fé.

The Boston Mountains.—A paper by Mr. A. H. Purdue, on the physiography of the Boston mountains, Arkansas, read at the Denver meeting of the American Association for the Advancement of Science, is published in No. 8 of the current volume of the *Journal of Geology*. The northern division of the Arkansas highlands, with its western extension into Indian territory, constitutes the southern part of the Ozark region. It is divided in Arkansas into a low and a high part, the former extending northward into Missouri, and passing along its southern border, into the latter, which forms the Boston mountain region, and consists of an irregular but bold escarpment from 500 to 1000 feet high. The whole division is structurally distinct from the southern highlands or Ouachita mountains, from which it is separated by the valley of the Arkansas river: it is a region of horizontally bedded rocks, somewhat disturbed by faulting and folding, while the Ouachita is essentially a folded region. To the north of the Boston mountains lies a low region of great denudation. From its north-eastern part all the rocks have been removed above the Ordovician, leaving those exposed at the surface. West and south of this is a region from which the Upper Carboniferous rocks have been removed, leaving those of Lower Carboniferous age at the surface. Standing up prominently on the latter are numerous hills of circumdenudation, composed of remnants of the horizontal strata of the Boston mountains. The height of these outliers very closely approximates to that of the plateau of which they were formerly a part. This uniformity of height suggests a peneplain, the determination of which forms the problem of the region, and offers some special difficulties, because while the denudation of the extensive region to the north has been very great and the topography is old, that of the Boston mountains is limited, and the topography is young. Mr. Purdue accounts for the difference in the stages of erosion by supposing the Boston mountain area to have been at a lower elevation than the area to the north at the time the extensive denudation was in progress on the latter, and that elevation to a height of about 2500 feet took place in the late Tertiary or in post-Tertiary time.

AUSTRALASIA AND PACIFIC ISLANDS.

Exploration in the Kimberley District of Western Australia.—Survey work of some importance was carried out last year by an expedition to the little-known interior of north-west Kimberley, under the leadership of Mr. F. S. Brockman, whose report has now been printed at Perth as an official paper. Among the members of the party were included Mr. C. Crossland as second in command, Mr. A. Gibb Maitland, the Government geologist, and Dr. F. M. House, as naturalist and botanist, and observations were made by them on the various aspects of the country traversed from a scientific point of view. The starting point was Wyndham, at the head of the western arm of Cambridge gulf, whence the western branch of the Pentecost river, named the Chamberlain by Mr. Brockman, was traced upward to about 17° S. It was found to flow in a narrow valley between high sandstone ranges and plateaux, the western wall being impracticable for horses for a long distance. A possible route was, however, discovered on this side, and the tableland crossed in a westerly direction towards the region north of the Leopold range, traversed by various streams flowing into inlets on the west coast of the Kimberley district. As far as the Charnley river it was a poor and rugged sandstone country, seamed by deep gorges, and uninhabited, but more promising districts, generally basaltic in formation, were afterwards discovered. The courses of various streams were determined, and the survey connected with points on the coast fixed on by admiralty surveys. Some difficulty was experienced in identifying positions laid down by the late Sir George Grey, in the region of the Glenelg river, but it was at last discovered that, probably owing to a clerical error, the

features in this neighbourhood were put down by that observer about 10′ south of their true position. The country further north was afterwards explored, and a considerable river, named the King Edward, discovered. It flows generally northward, and empties itself into Napier Broome bay. The return journey hence to Wyndham was made by the parallel valley of the Drysdale, which was also explored independently by Mr. Crossland. The whole region is estimated to contain three-fourths of sandstone to one-fourth basaltic country, the latter attaining its greatest elevation (about 2500 feet) in about 16° S., 125°–126° E., in which locality the basalt appears to have originated. This country has a soil of reddish loam, splendidly grassed throughout. The sandstone area consists generally of table-lands covered with light sandy soil, poorly grassed except near the higher basalt country, and seamed with deep and rugged gorges. The extent of valuable pastoral country north of the Leopold range is estimated by Mr. Brockman at between 7,000,000 and 8,000,000 acres, most of it eminently suited for sheep, and all of it for cattle and horses. Apart from its grazing capabilities no product of commercial value was discovered. The pastoral country is not everywhere accessible to the coast by reason of the rugged sandstone ranges by which this is lined, but it is considered that Walcott inlet might be utilized as a means of access to the southern portion, while the whole of the country north of 16° can best be served by the establishment of a port on Napier Broome bay or Vansittart bay, the former possessing an especial advantage in its good water-supply. The climate may be considered a good one, although the region is well within the tropics. The natives, who were generally met with in small hunting-parties, and are evidently nomadic in their habits, seem to belong to two distinct types, those to the south of 15° being tall and light of limb, while those further north were of a shorter and more robust type. All had axes and chisels of iron, principally cart-tire iron or shovel blades, which seem to have reached them by inter-tribal barter across from the gold-fields. Large numbers of rock paintings were seen in the western part of the district, and are specially dealt with in the report. Kangaroos of many varieties are especially numerous on the basalt lands, and the many rivers and creeks abound in fish, but water-fowl are surprisingly rare, possibly owing to the large number of crocodiles—the small harmless variety—found in the pools.

Biology of the Chatham Islands.—In a paper recently read before the Manchester Literary and Philosophical Society, Prof. Arthur Dendy treated of the Chatham islands, mainly with reference to their biology. The fauna and flora of the group are shown to be isolated detachments of those of New Zealand, with which latter place these islands appear to have at one time been connected. There are, however, many striking differences in species and varieties, which imply a long period of isolation. It is pointed out as probable that during the Upper Pliocene period the area of New Zealand was greatly extended, so as to embrace, for example, Chatham island in the east, Lord Howe island in the north-west, Auckland and Campbell islands in the south, which area has been styled by Diels "Great New Zealand." This condition is supposed to have lasted on into Pleistocene times, and to have been followed by another depression, which left the islands very much in their present condition. The author brings forward three reasons to account for the existing differences between the fauna and flora of the Chatham islands and those of New Zealand. He points out that—(1) The climate of the Chatham islands is only suitable for certain portions of the New Zealand flora. (2) In the days of "Great New Zealand" an enormous desert tract must have existed between the Chathams and New Zealand proper, which doubtless formed a serious barrier to the migration both of plants and animals. A number of temperate types, however, appear to have reached the Chathams along

the coast from the south. The vegetation of the Chatham islands is largely of a coastal type, and the absence of many of the characteristic elements of the New Zealand flora, as possibly also of the Moas and Riwis, may be due to conditions of climate. (3) Sufficient time has elapsed since the islands again became disconnected from the mainland to permit of the origin of many new species or varieties. The author points out that the importance of isolation in the development of new species could hardly be better illustrated than in the fauna and flora of the Chatham islands.

The Marianne Islands.—An interesting account of a recent visit to the northern islands of the Marianne group, by a German Government official, Herr Fritz, appears in the *Mitteilungen a. d. Deutschen Schutzgebieten* (1902, No. 2), accompanied by a series of sketches which give an excellent idea of the physical character of the several islands. The northern portion of the group (north of 16°) differs from the southern in the almost entire absence of coral formation, which in the six southern islands covers the volcanic core to the very summit of the peaks. The northern islands are formed of purely volcanic rocks, coral rock being rare even on the coasts. On certain of them the volcanic cones are still active, while the remains of old craters, now extinct, are plainly visible on others. Medinilla, the first of the islands described by Herr Fritz, belongs to the southern group, and the sketch given of it shows its totally different character. It is a coral rock rising steeply from the sea to a height of 100 feet, the top being a nearly level plateau, covered with low bush, grass, and lilies. Of the purely volcanic islands, the smaller consist of single or double cones, while the largest of all, Pagan, contains an irregular group of peaks in the south (including one active volcano) and an isolated volcano in the north, the two portions of the island being united by a belt of lowland. Assongsong (which the Spaniards corrupted into Asumcion, but which is really a Khamorro name, and means "belonging to the Songsong," a family still residing on Rota) is an almost perfect cone, broken at the summit by a small crater, and is the highest of the Mariannes (3120 feet). It abounds in extraordinarily large land-crabs, which have brought about the diffusion of the coconut palm over the whole island. Perhaps the most remarkable of the group is Maug ("hole"), formerly known also as Tunas ("steep"), and incorrectly named Uracas on the chart, this being the old name for the Farallon de Pájaros, the northernmost island of the group. Maug is composed of three rocky islands, the remnants of an old crater, which enclose a deep and spacious harbour. According to Ibañez, the destruction of the old crater was subsequent to the first arrival of the Spanish missionaries, but a passage in Le Gobien's 'Histoire des Isles Marianes' (1699) shows that this is incorrect. The islands fall steeply to the harbour, and their ridges are crowned with pillar-like projections of rock, which are the continuations of perpendicular veins of hard basalt. It was possibly on this account that the name "Las Monjas" was given to Maug by the Spaniards. The only industry at present practised on the islands is the collection of copra. The three islands Alamágan, Págan, and Agrigan are leased for the yearly sum of 8000 marks, in addition to which payment the lessees (a Japanese and two natives) have undertaken important services for the Government. Herr Fritz thinks that in the future more may be done to develop the islands, which possess advantages in their good harbours. In old times the group was much more peopled than at present, but Herr Fritz searched in vain on several of the islands for remains of ancient settlements.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Term "Indian Summer."—An elaborate dissertation on the origin and use of the term "Indian summer" is contributed to recent numbers of the

Monthly Weather Review (1902, Nos. 1 and 2), by Mr. Albert Matthews, who, from a careful study of English and American literature, arrives at the conclusion "that the term 'Indian summer' first made its appearance in the last decade of the eighteenth century; that during the next decade the expression 'second summer' was used, indicating that there was no generally accepted designation for the supposed spell of peculiar weather in autumn; that this spell itself was first noticed shortly before 1800; that the term 'Indian summer' became established about twenty years after its earliest appearance; that it was first employed in Western Pennsylvania; that it spread to New England by 1798, to New York by 1809, to Canada by 1821, and to England by 1830; that the term is not merely an Americanism, but has become part of the English language in its widest sense. . . . In short, to write in praise of the 'Indian summer' is now a literary convention on three continents." On coming, however, to the second part of the study, the endeavour to account for the origin of the term, the writer finds it more difficult to arrive at any definite conclusion. The explanations given, both of the precise meaning of the term and of the reason for its use, have been extraordinarily various, and none of them is altogether convincing. The numerous extracts given by Mr. Matthews show that writers differ as to the special characteristics of "Indian summer" (though haziness is considered its attribute by a majority of them), as well as to the part of the United States in which it is mainly experienced. Of the many suggested explanations of the origin of the term perhaps the most noteworthy are—(1) That such a spell of warm weather was predicted by Indians; (2) that the smokiness of the atmosphere at the time in question was due to the burning of the prairies by the Indians; (3) that the Indian summer was used by the Indians for their last attacks on the settlements before the setting in of winter; (4) that it partook of the Indian character of deceptiveness; (5) that the name was applied by some traveller who had been in India, and who noticed the resemblance of the weather to that of the plains of India in the dry season. This last would seem the most plausible, though Mr. Matthews doubts whether many visitors to the United States towards the close of the eighteenth century had previously been in India. It is somewhat remarkable that the term was used by Horace Walpole so early as 1778, but it is conclusively shown that this had no reference to America, but was merely used to denote heat such as is characteristic of the tropics. Mr. Matthews quotes the expression "Squaw winter" as applied to the preceding spell of cold weather, and it seems possible that if this could be explained, some light might be thrown on the parallel term.

Botanical Geography and its Practical Application.—Mr. Hardy, in a paper in the *Scottish Geographical Magazine*, lays stress on the practical value of a study of botanical geography, with a view to obtaining from the soil the largest yield compatible with the preservation of its resources. The two physiographic conditions on which vegetation depends are those of climate and soil. During the course of ages, the combined influence of these has brought about such special characterization and grouping of plants, as to enable maps to be constructed showing the distribution of various "plant associations." A plant association will consist not only of plants possessing homologous methods of adaption to their physical environment, but of others which find their most favourable or exclusive stations in conditions determined by these homologous plants. Since climate is the chief factor which determines the great phyto-geographical regions, the geographer Köppen has found it possible to indicate these on a map of the principal climates; but in the determination of the smaller regions it is the soil that plays the most important *rôle*. Botanical cartography has made

great progress in recent years, as, *e.g.*, in the maps of Prof. Flahault for France, and the late Mr. Robert Smith for parts of Scotland. Such botanical surveys are badly required for agriculture development, and Mr. Hardy dwells at length on the special need of forest surveys and on the desirability of reforesting certain districts, more particularly the highlands of Scotland. The evils resulting from excessive deforestation are manifest in the Mediterranean region, on the Alps and Pyrenees, and in parts of Russia; while historic evidence is not wanting to prove that valuable forests once extended over large areas in Scotland, now only covered with heather, peat-bogs, and marshes. Timber is in increasing demand, and unless steps are shortly taken to create fresh supplies, there seems reason to fear that the supply will cease to meet the need, and the world may be suffering from a timber famine in another fifty years. Even the great forests of Canada and Sweden are rapidly disappearing in the face of disastrous forest fires and the wood-pulp industry. Mr. Hardy points out that the Scandinavian countries, which have always been noted for their great and vigorous forests, in geological structure closely resemble the highlands, while the latter region has the advantage of a milder temperature. From this he argues that physical conditions would favour the reforestation of large tracts of North Britain, an undertaking which without doubt would indirectly contribute to the salubrity and habitability of the country, and furnish, in time, a profitable employment for a large proportion of the population.

GENERAL.

Vacation Course at Oxford.—In connection with the School of Geography, a special course of lectures and practical work, both in and out of doors, was held between July 29 and August 21. It was specially designed for teachers, and the gratifying number of thirty, half of whom were women, took advantage of it. Of the students, two were university and college lecturers, five were lecturers in training colleges, and the others were masters and mistresses in public high and preparatory schools. With two exceptions, the men were university graduates. One student hailed from America, two from Wales, five from Scotland, and the others from the south of England. Mr. Mackinder delivered the opening lecture on the Scope and Methods of Geography. Mr. Dickson discussed Recent Advances in Geophysics and Climatology, especially modern theories of the figure of the Earth, atmospheric circulation, ocean currents and tides, and conducted the field class, which learned how to map with plane-table, prismatic compass, and clinometer. Mr. Darbishire held a class for Map-drawing. Mr. Herbertson lectured on Typical Land Forms and Their Distribution, and, with the assistance of Miss Croom-Brown, gave demonstrations of relevant large-scale maps, and lessons on the reading and interpretation of them. Mr. Beazley lectured on the History of Exploration, especially in more modern times. Economic geography was discussed by Mr. Beazley, whose subject was Land Trade Routes, Present and Past; and by Mr. Herbertson, who dealt, by request, with the Economic Zones and their Influence on Maritime Trade. The library of the school was much used, and Miss Croom-Brown acted as librarian. The course ended with two whole-day excursions, in both of which Mr. Mackinder took part. One was to the Windings of the Eventode, conducted by Mr. Herbertson, and the other to the Upper Coln and the Thames-Severn Divide, conducted by Mr. Dickson.

OBITUARY.

Dr. Johann Jankó.

We have to record the death of the ethnographer, Dr. Johann Jankó, which took place on July 28 at Borszék, a small watering-place in the eastern Carpathians, in the thirty-fourth year of his age. Jankó was widely known through the researches he carried out and published for Count Eugen Zichy. Born at Budapest on March 13, 1868, he studied at the university there, and graduated in 1890. He travelled in Egypt in 1888, in Tripoli and Tunis in 1889, and in 1890 and 1891 was sent to study the ethnographical institutions of France and England. During 1892 he acted as assistant in the Geographical Institute of the university of Budapest under Ludwig von Lóczy, and during 1894 as assistant curator in the ethnographical department of the Hungarian National Museum. In 1898 he made his arduous journey on behalf of Count Zichy through the marshy forests of the middle Ob and its tributaries, the region of the Ostiaks of western Siberia (see *Geographical Journal*, September, 1900, p. 347). On his return in 1900 with vast quantities of material, which were not fully worked out at the time of his death, he was appointed Director of the Ethnographic Department of the Museum. Amongst his publications may be mentioned, 'Das Delta des Nils,' 1890; 'Das ungarische Volk von Kalota,' 1892; 'Das ungarische Volk von Torda, Aranyosszék und Torszko,' 1893; 'Die Herkunft der magyarischen Fischerei,' 1900; 'Anthropologische Studien über die Ostiaken,' part still unpublished. As a member of the Commission for investigating Lake Balaton, he worked at an 'Ethnographie der Umwohner des Plattensees,' in connection with which he made large numbers of measurements in a laboratory equipped under his direction. A first series of 'Magyarischen Typen' appeared in 1900. Dr. Jankó was secretary of the Hungarian Geographical Society for a year, and latterly editor of the Zeitschrift of the Ethnographical Society.

Dr. Alexander Bittner.

Dr. Alexander Bittner, geologist-in-chief in the Geological Survey Office in Vienna, died suddenly of heart failure on March 31. Born in Friedland, in Bohemia, on March 16, 1850, he attended the Gymnasium of Ticin and Prague, and in 1869 went to the University of Vienna, beginning his official connection with the Geological Survey in 1871. His geological field-work, however, dates from 1874, when he distinguished himself in the survey of the classical grounds of eastern central Greece, and later he took part in the Austro-Hungarian survey of south-eastern Bosnia and Herzegovina. Then followed surveys in south-west Tirol, southern Styria, and the northern limestone Alps. Most of his papers appear in the publications of the Academy of Sciences and of the Geological Institute of Vienna. Bittner was also a collaborator in Hofrath Becher's 'Hernstein in Niederoesterreich,' published by commission of the Archduke Leopold; and it was his work in connection with this which first led him to take up the investigation of the limestone Alps. He also took part in the scientific exploration of the Platten See. Bittner was not only a noted palæontologist, and as such an authority on the Alpine Trias, but as a stratigraphical geologist he gave much attention to geomorphology. His knowledge of the limestone Alps between Vienna and Salzburg was unique.

CORRESPONDENCE.

Waltzemüller's Globe of 1507.

Mr. Chisholm (*Geographical Journal*, vol. xix., p. 389) is quite right when he assumes the word *solidum* in the title of Waltzemüller's 'Cosmographiæ Introductio' to refer to a globe. The lunes of a small globe, corresponding in every respect to the description there given, are now in the collection of Prince Liechtenstein. These lunes were first recognized by Varnhagen as being the work of Waltzemüller (*J. Schoener e P. Apianus*, Vienna, 1872), whilst the learned French geographer, L. Gallois (*Les Géographes allemands de la Renaissance*, Paris, 1890), who publishes a facsimile of them, holds the same opinion, and advances solid arguments in favour of the date 1507 being assigned to it. Prof. Wieser's preliminary notes on the large map of the world recently discovered at Castle Wolfegg (see Mr. B. S. Soulsby's article, *Geographical Journal*, xix. p. 201) go far to confirm these hypotheses, for, apart from differences of scale and the resultant fuller nomenclature, the map and the globe seem to be absolutely identical. Nor can there be a doubt that the map, of which an edition of one thousand copies was printed, was freely made use of by Glareanus (1510), Joannes de Stobnicza (1512), Boulenger (1519), Peter Apianus (1520), and Schöner (1515 and 1520). It has been suggested that Schöner (or Waltzemüller) copied Behaim's globe of 1492. This, however, could refer only to Eastern Asia, and especially the chain of islands stretching from Madagascar and Zanzibar to Candym and Cipangu, for only in this quarter of the world do the two delineations agree. I cannot for a moment admit this suggestion. Both Behaim and Waltzemüller had evidently access to maps of an earlier date, maps which were likewise drawn upon by the engraver of the Laon globe. On this globe there certainly is a legend, below the *Mons Niger*, the furthest point reached by Cão in 1483, that "thus far did the Portuguese ships advance up to 1493," but a glance at its outline should satisfy the most sceptical that this document is of a date much more ancient than that to be inferred from this legend. Its author knew nothing even of the discoveries made by direction of Prince Henry the Navigator, and still less of those made subsequently by Cão and Diaz. I believe, in fact, that the names *S. Thomas* and *Mons Niger*, as well as the legend above referred to, were added years after the globe had been completed, just as some of our modern map publishers have added a recent date to an old and obsolete map, in the hope of thus giving it a new lease of life.

I avail myself of this opportunity to point out that Dr. L. Henkel's map of the Mediterranean, showing the visibility of land, is not the first map of that description (*Geographical Journal*, xix. p. 502), but has been preceded by a similar map designed by me in illustration of the voyages of Cão and Diaz, which was published in your *Journal* for December, 1900, or more than a year before Dr. Henkel's map appeared in the *Mitteilungen*.

E. G. Ravenstein.

The Shwe-li and Tai-ping.

The following is an excerpt from a letter from Mr. H. Hayter Duff to myself on this subject (see *Geographical Journal* for July, 1902).

R. L. Jack.

Sima, North-East Frontier, Upper Burma, July 24, 1902.

With reference to the Shwe-li and Tai-ping, I would wish to add the following remarks and corrections to my first letter to you.

The Shwe-li or Lung Kiang rises north-east of the Tai-ping, and very probably not more than 5 to 10 miles north. Above the Tali-fu-Yung-chang-Teng-yueh road it is hemmed into a very narrow valley, and has no tributaries to speak of. The area it drains south of the above point increases considerably, and as it joins the Irawadi below Katha, and just about opposite to Tig-yaing, the Tai-pi-no (so often erroneously called the Tai-ping), on the contrary, is joined by quite considerable streams within the first 20 miles or so of the river, and drains quite a considerable area compared to the Shwe-li in its (the Shwe-li's) upper reaches; hence the difference in quantity of water noted by you. Another point, too, is that the rainfall decreases towards the east of the Irawadi watershed and the outlying spur which separates the Shwe-li basin from the Salwen, and, indeed, the whole country east of Tai-ping, owing to long-continued deforestation and general barrenness of the soil, for many a long year had a much smaller yearly rainfall than that which falls in the Irawadi basin. This, too, would conduce to the less volume of water carried down by the Shwe-li in its upper reaches. As, however, it flows into the Irawadi basin proper, and receives the drainage of the part of the lower hills of the north Shan States round south of Bhamo, its volume increases rapidly in the rains—sends down an enormous volume of water into the Irawadi (I have seen the Shwe-li in flood).

This information of mine is, I am quite sure, perfectly correct.

North again of the Shwe-li are one or two fairly big streams, which join the Salwen north of parallel 26° or so. (The sources of the Tai-ping and Shwe-li are between 25° 38′ and 25° 50′ approximately.) The Salwen at that parallel takes a big bend in towards the west, and its distance from the Irawadi at about parallel 26° 45′ or 27° I estimate cannot be more than 60 miles as the crow flies. It is very probable that it was at that near approach of these two great rivers that the Chinese mountain tribes came first into contact with the hill tribes of the Irawadi basin, producing the hybrid tribes of Lashis and Azis.

The subject to me is one of intense interest, and, having sojourned up here so many years, I have, of course, had opportunities of theorizing and proving my theories, *and* the reverse.

H. Hayter Duff.

Earthquakes in Kashgar.

45, Hornsey Rise Gardens, London, N.,
September 18, 1902.

I transmit to you the following information regarding earthquakes in Kashgar, which I have just received, by a letter dated the 23rd of August last, from my substitute Captain P. J. Miles, British Agent at Kashgar:—

"We have just had a terrible earthquake here. Mr. Petrovski says he has not had a similar experience in these parts. The seismic waves seemed to move from north to south.

"As regards this house, the porch was shaken down, but otherwise no very serious damage was done. The Russian Consulate too has suffered a little.

"A good deal of mischief has been done in the town, yamêns, &c., and there have been some deaths owing to fallings of walls.

"Mr. Petrovski is informing the Russian Geographical Society; and he has kindly given me the following data as to the times of the different shocks:—

"22*nd August*.—8 a.m., severe shocks, 1½ min.; 8.35–9.15, shocks were felt; 915, shocks stronger; 10, two shocks; 12 noon, one shock; 1 p.m., one shock;

2.30, one shock; 3, one shock; and up to 5 p.m. tremblings were felt. The first shock at 8 a.m. caused the main part of the damage.

"Again, last night, between 7.30 p.m. and 9.30 p.m. there were some pretty severe tremblings, and there may have been others during the night. Even as I write now at 8 a.m., there has been a shock."

GEORGE MACARTNEY.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

France—Cevennes. *B.S. Languedoc. G.* **24** (1901): 405–444. **Viala.**

La Sérane et ses Mines d'Or. Par M. F. Fernand Viala.

France—Hérault. **Sahuc.**

B.S. Languedoc. G. **24** (1901): 67–94, 232–261, 333–348, 488–500.

Sources historiques et bibliographie de l'arrondissement actuel et de l'ancien diocèse de Saint-Pons-de-Thomières. Par J. Sahuc.

France—Languedoc. **Calvet.**

B.S. Languedoc. G. **24** (1901): 213–231, 316–332, 467–487; **25** (1902): 43–68.

La Montagne noire. Par J. Calvet. *With Map and Illustrations.*

France—Meteorology. *Ann. G.* **11** (1902): 203–220. **Blanchard.**

La pluviosité de la plaine du Nord de la France. Par Raoul Blanchard. *With Maps and Diagrams.*

Germany—Botany. **Schulz.**

Aug. Schulz: Ueber die Entwicklungsgeschichte der gegenwärtigen phanerogamen Flora und Pflanzendecke Mitteldeutschlands. (Sonderabdruck aus den Berichten der Deutschen Botanischen Gesellschaft, Jahrgang 1902, Band xx. Heft 2.) Berlin, 1902. Size 9½ × 6½, pp. 54–81. *Presented by the Author.*

Germany—Nordstrand. *Globus* **82** (1902): 31–32. **Hansen.**

Die Insel Nordstrand um 1600. Von R. Hansen.

Based on accounts of the island and its inhabitants written by Pastor Johannes Petersen in the sixteenth century.

Germany—Rhine and Westphalia. **Lampe.**

Vierteljahrs. G. Unterricht **1** (1902): 251-263.

Ein Studienausflug von Berliner Oberlehrern in das rheinisch-westfälische Industriegebiet. Von Dr. Felix Lampe.

Germany—Weser & Sons. **Keller.**

Weser und Ems: ihre Stromgebiete und ihre wichtigsten Nebenflusse. Eine hydrographische, wasserwirthschaftliche und wasserrechtliche Darstellung. Auf Grund des Allerhochsten Erlasses vom 28 Februar 1892 im Auftrage des preussischen Wasser-Ausschusses herausgegeben von H. Keller. 5 vols. and Atlas (Vol. v. Tables.) Berlin: Dietrich Reimer (Ernst Vohsen), 1901. Size (vols. i.-iv.) 11½ × 7½; (vol. v.) 13½ × 10; (atlas) 21 × 18. Pp. (vol. i.) xviii., 336, and 168; (vol. ii.) 604; (vol. iii.) 700; (vol. iv.) 576; (vol. v.) 246. *Price*, Text 48*m.*; Atlas 56*m.* *Presented by the Publisher.*

This important work will be specially reviewed. It is the fourth of the series, of which the first appeared in 1896, and completes the detailed description of the hydrography of the principal German river-systems.

Germany—Württemburg. *Deuts-h. Rundschau G.* **24** (1902): 444-455. **Kammerer.**

Der Hohe Neuffen. Von J. Kammerer. *With Illustrations.*

Greece. *Petermanns M.* **48** (1902): 106-110. **Philippson.**

Nachträge zur Kenntnis der griechischen Inselwelt. Von Prof. Dr. Alfred Philippson. *With Map.*

Hungary—Kremnitz. ——

Deutsche Rundschau G. **24** (1902): 165-171, 219-222, 259-264, 310-317.

Kremnitz in Oberungarn. *With Illustrations.*

Italy—Apulia. *Petermanns M.* **48** (1902): 115-119. **Fischer.**

Eine siedlungskundliche Studie über Apulien. Von Prof. Dr. Th. Fischer.

Italy—Chioggia. **Pinotti.**

A travers le Monde, Tour du Monde **8** (1902): 217-219, 225-228.

Une Venise pauvre: "Chioggia et les Baruffe Chiozzotte" de Goldoni. Par F. Pinotti. *With Illustrations.*

Italy—Historical. *B.S.G. Italiana* **3** (1902): 493-523. **Rosetti.**

Montefeltro. Note di geografia storica del Emilio Rosetti. *With Illustrations.*

Italy—Sardinia. *Riv. G. Italiana* **9** (1902): 380-382. **Lovisato.**

Le cime più elevate del Gennargentu. Del D. Lovisato.

See note in the Monthly Record for June (p. 751).

Macedonia. *Abh. K.K.G. Ges. Wien* **4** (1902): 1-170. **Oestreich.**

Beiträge zur Geomorphologie Makedoniens. Von Dr. Karl Oestreich. *With Maps.*

Montenegro. *Blackwood's Mag.* **171** (1902): 733-744. ——

Montenegrin Sketches.

Rhine. *Globus* **82** (1902): 21-28. **Walter.**

Die Stromschnelle von Laufenburg. Von Dr. Heinrich Walter. *With Illustrations.*

Cf. note in the *Journal* for August (p. 225).

Rumania. *Deutsch Rundschau G.* **24** (1902): 419-421. ——

Die Petroleumproduction in Rumänien. *With Map.*

Rumania—Geographical Dictionary. **Lahovari, Brătianu, and Tocilescu.**

Societatea Geografică Română. Marele Dicţionar Geografic al Romîniei alcătuit şi prelucrat dupa dicţionarele parţiale pe judeţe de George Joan Lahovari, şi General O. J. Brătianu, Grigore G. Tocilescu. Volume iv. Bucuresti: J. V. Socecŭ, 1901. Size 12½ × 9½, pp. 792. *Presented by the Societatea Geografică Română.*

Russia. *Vierteljahrs. G. Unterricht* **1** (1902): 229-230. **Immanuel.**

Canalverbindung zwischen dem Kaspischen und Asow'schen Meere. Von Hauptmann Immanuel.

Russia. **Lodijenaky and others.**

Glasgow International Exhibition, 1901. Russia, its Industries and Trade. Issued by order of State Secretary S. J. De Witte Imperial Russian Minister of

Finance. Glasgow: Hay, Nisbet & Co., 1901. Size 9½ × 7½, pp. xii. and 324. *Map. Price* 4*s.* 6*d.*

A useful summary of the economic conditions of Russia, by various authors.

Russia—Finland. *Fennia* **10** (1894–1901): No. 2, 1–242. ——

Katalog öfver trigonometriska och astronomiska punkter i södra Finland intill 61sta breddgraden bestämda åren 1860–1886 af Ryska Generalstabens Topografiska Afdelning. *With Map.*

ASIA.

Chinese Empire—Nan-shan. *Petermanns M.* **48** (1902): 97–106. **Diener.**

Die wichtigsten geographischen und geologischen Ergebnisse der Reisen W. Obrutschews im zentralen und westlichen Nan-schan. Von Prof. Dr. C. Diener. *With Map.*

Dutch East Indies—Bibliography. **Nijhoff.**

A list of the best books relating to Dutch East India, made up in commemoration of the Third Centenary of the Foundation of the East India Company (March 20, 1602), and offered at the affixed prices by Martinus Nijhoff, Bookseller. The Hague, 1902. Size 19 × 6½, pp. 40. *Map (on cover).*

The map is a reproduction of that accompanying Houtman's voyage.

Dutch East Indies—Gold. **Carthaus.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **19** (1902): 581–586.

Ueber Goldlagerstätten in Niederländisch Indien, nebst Beobachtungen über den Aufbau des Gebirges im Flussgebiete des oberen Gadis (Sumatra), briefliche Mittheilung von Dr. E. Carthaus.

India. *J.R. Statistical S.* **65** (1902): 209–283. **Atkinson.**

A Statistical Review of the Income and Wealth of British India. By Fred. J. Atkinson.

India—Assam. ——

Agricultural Department, Assam. Bulletin No. 8. (Revised Edition of Bulletin No. 2, Agricultural Series.) Agricultural Series 4. List of the Cultivated Plants of Assam. Revised. Size 13 × 8, pp. 26 and iv. *Price* 2*d.*

Indian Ocean—Aldabra. **Voeltzkow.**

Ueber Coccolithen und Rhabdolithen nebst Bemerkungen über den Aufbau und die Entstehung der Aldabra-Inseln. Von A. Voeltzkow. Die von Aldabra bis jetzt bekannte Flora und Fauna. By the same. (Sonderabdruck aus den Abhandlungen der Senckenbergischen naturforschenden Gesellschaft, Band xxvi. Heft iv.) Frankfurt a. M., 1901. Size 11½ × 9, pp. 467–538, 541–566. *Presented by the Author.*

These papers will be specially noticed.

Japan—Bonin Islands. **Yoshiwara.**

Geological Magazine, N.S., Decade iv. vol. ix. (1902): 296–303.

Geological Age of the Ogasawara Group (Bonin Islands), as indicated by the occurrence of Nummulites. *With Maps.*

Japan—Formosa. **Campbell.**

Formosa under the Japanese: being notes of a visit to the Taichu Prefecture. By Rev. W. Campbell. Helensburgh, 1902. Size 9½ × 6, pp. 30.

Japan—Formosa. **Kenny.**

Trade of South Formosa for the years 1900 and 1901. Foreign Office, Annual No. 2796, May, 1902. Size 9½ × 6, pp. 28. *Price* 2*d.*

Malay Archipelago—Borneo. *B.G.S. Philadelphia* **3** (1901): 51–64. **Hiller.**

Manners and Customs of the People of Southern Borneo. By H. M. Hiller. *With Illustrations.*

Malay Archipelago—Celebes. **Marle.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **18** (1901): 932–953; **19** (1902): 108–143, 373–403, 535–552.

Beschrijving van het Rijk Gowa (Celebes). Door V. J. van Marle. *With Map and Profiles.*

Manchuria. **Samson-Himmelstjerna.**

Kolon. Z. **3** (1902): 124–126, 141–142, 159–161, 176–179, 198–200, 218–219.

Gelbrussland. Von H. v. Samson-Himmelstjerna.

Persian Gulf. *Imp. and Asiatic Quarterly Rev.* **13** (1902): 225–234. **Lynch.**

The Persian Gulf. By H. F. B. Lynch.

Philippine Islands—Magnetism. **Doyle.**

Magnetical Dip and Declination in the Philippine Islands. Brief Notice of the Same. By Rev. John Doyle. Manila, 1901. Size 8½ × 6½, pp. 10. *Diagrams.*

Russia—Caucasus. **Stevens.**

Trade of Batoum and District for the year 1901. Foreign Office, Annual No. 2782, 1902. Size 9½ × 6, pp. 28. *Price* 2*d.*

Russia—Siberia. *Asien* **1** (1902): 122–127, 133–138. **Krafft.**

Reiseerinnerungen aus Sibirien und dem Uralgebiet. Von Hauptmann Krafft. *With Map.*

AFRICA.

Congo. *Ann. Hydrographie* **30** (1902): 360–361. ——

Wahrnehmungen von Stromgeschwindigkeiten und -richtungen vor der Congo-Mündung am 15 April, 1902. *With Diagram.*

Egypt. *Petermanns M.* **48** (1902): 110–112. **Kumm.**

Die südliche Karawanenroute von der oase Charga nach Dachla (Darb-Er-Rubari). Von H. K. W. Kumm. *With Map.*

Egypt. **Willcocks.**

Egypt Fifty Years hence. An Address delivered at a Meeting of the Khedivial Geographical Society, with H. E. Abbate Pasha, President of the Society, in the Chair. Cairo, March 15, 1902. By Mr. W. Willcocks. Cairo, 1902. Size 9½ × 6, pp. 36.

A forecast of the economic development of the Nile valley, as the result, in particular, of extended irrigation, during the next fifty years. The writer advocates the settlement of Fellahin in the upper part of the valley.

Egypt—Irrigation. *Z. Ges. Erdk. Berlin* (1902): 305–322, 390–410. **Lampe.**

Die Bewässerung Ägyptens. Von Dr. Felix Lampe.

Egypt—Orthography. ——

Rules of Orthography for Native Names of Places, Persons, etc., in Egypt and the Sudan (with Index). Second Edition. Cairo, 1901. Size 9½ × 6½, pp. 26. *Presented by the Intelligence Office, War Office, Cairo.*

The spellings are based on the R.G.S. system, slightly modified to suit the special requirements of the case. The forms Suakin, Addis Abbaba, Mohammed, Khartoum, are adopted. In the case of the last-named it is to be regretted that the old form is retained, as Khartum has now been widely adopted, while the corresponding form Sudan is accepted.

Egypt—Sinai. **Hume.**

The Rift-Valleys and Geology of Eastern Sinai. By W. F. Hume, D.SC. Read before the International Geological Congress, Paris, August, 1900. London: Dulau & Co., 1901. Size 8½ × 5½, pp. 50. *Presented by the Author.*

Fernando Po and Spanish Guinea. *B.R.S.G. Madrid* **43** (1901): 273–309. **Vilches.**

Fernando Póo y la Guinea española. Por el commandante Don Eladio López Vilches.

German East Africa. **Dundas.**

Trade of German East Africa for the year 1901. Foreign Office, Annual No. 2819, 1902. Size 9½ × 5, pp. 24. *Price* 1½*d.*

German East Africa. *Deutsch. Kolonialblatt* **13** (1902): 257–259. **Neuhaus.**

Aus dem Bezirk Pangani.

Kamerun. *Globus* **81** (1902): 333–337, 350–354, 369–372. **Conradt.**

Die Ngúmba in Südkamerun. Auf Grund längeren Aufenthaltes unter ihnen dargestellt von L. Conradt. *With Map.*

Kamerun. *Deutsch. Kolonialblatt* **13** (1902): 90–92, 162–163, 238–239. **Pavel.**

Expedition des Oberstleutnants Pavel.

The expedition made its way (*viâ* Bali) to Banyo, one of the southern sultanates of Adamawa.

Kamerun—Cartography. *Z. Ges. Erdk. Berlin* (1902): 428–433. **Singer.**
Zur Kartographie von Kamerun. Von H. Singer.

Madagascar. *Rev. Madagascar* 4 (1902): 289–314. **Baldauf.**
Journal de Route du Bas Manambovo à Tuléar. Par Sergent Baldauf. *With Illustrations.*

NORTH AMERICA.

America. *Deutsch. Rundschau G.* 24 (1902): 433–444. **Jüttner.**
Fortschritte der geographischen Forschungen und Reisen im Jahre 1901. 1. Amerika. Von Dr. J. M. Jüttner.

Canada—Bibliography. **Wrong and Langton.**
Review of Historical Publications relating to Canada. Edited by Prof. George M. Wrong and H. H. Langton. Vol. vi. Publications of the year 1901. The University of Toronto. Published by the Librarian, 1902. Size 11 × 7, pp. xiv. and 226.

Canada—New Brunswick. **Ganong.**
A Monograph of the Evolution of the Boundaries of the Province of New Brunswick. (Contributions to the History of New Brunswick, No. 5.) By William F. Ganong, M.A., PH.D. (From the *Transactions of the Royal Society of Canada*, Second Series, 1901–1902. Vol. vii. Section ii. English History, Literature, Archæology, etc.) Ottawa: J. Hope & Sons, 1901. Size 10 × 6½, pp. 139–450. *Maps. Presented by the Author.*

This will be specially noticed.

Canada—Red River Settlement. **Hunt.**
Britain's One Utopia. By Frank L. Hunt. (Historical and Scientific Society of Manitoba, Transaction No. 61.) Winnipeg, 1902. Size 9 × 5½, pp. 16. *Presented by the Historical and Scientific Society of Manitoba.*

Canada—Rocky Mountains. ———
A Famous Mountaineer in the Canadian Rockies. Issued by the Passenger Department, Canadian-Pacific Railway Co., 1902. Size 7½ × 5, pp. 24. *Illustrations. Presented by the C. P. Ry. Co.*

On Mr. Whymper's recent work in the Rocky mountains.

Canada—Rocky Mountains. *National G. Mag.* 13 (1902): 151–168, 185–200. **Wilcox.**
Recent Exploration in the Canadian Rockies. By Walter D. Wilcox. *With Map and Illustrations.*

Labrador. *B.G.S. Philadelphia* 3 (1902): 65–212. **Delabarre.**
Report of the Brown-Harvard Expedition to Nachvak, Labrador, in the year 1900. By E. B. Delabarre, PH.D. *With Maps and Illustrations.*

North America—Earthquakes. *Z. Ges. Erdk. Berlin* (1902): 367–389. **Deckert.**
Die Erdbebenherde und Schüttergebiete von Nord-Amerika in ihren Beziehungen zu den morphologischen Verhältnissen. Von Dr. Emil Deckert. *Maps.*

United States—Arizona. *Sierra Club B.* 4 (1902): 77–87. **Brewer.**
Into the Heart of Cataract Cañon, Grand Cañon of Arizona. By Rev. William A. Brewer. *With Map and Plates.*

United States—Boundaries. ———
Report of a Conference upon the Boundaries of the Successive Acquisitions of Territory by the United States, November, 1899, to January, 1900. (Twelfth Census of the United States. Census Bulletin, No. 74, July 20, 1901.) Washington. Size 11½ × 9, pp. 4. *Map.*

United States—California. *American J. Science* 14 (1902): 33–37. **Hershey.**
Significance of Certain Cretaceous Outliers in the Klamath Region, California. By O. H. Hershey.

United States—California. *Sierra Club B.* 4 (1902): 88–99. **Le Conte.**
My Trip to King's River Cañon. (Reprint.) By Dr. Joseph Le Conte. *With Plate.*

United States—California. *Science* 15 (1902): 670–672. **Smith.**
The Submarine Valleys of the California Coast. By W. S. Tangier Smith.

See note in the Monthly Record for July (*ante*, p. 104).

United States—Historical. *Rev. G.* **50** (1902): 127–140, 201–217. **Viallate.**
Le développement territorial des États-Unis. Par Achille Viallate. *With Map.*

United States—Iowa—Loess. *J. Geology* **10** (1902): 245–251. **Udden.**
Loess with Horizontal Shearing Planes. By J. A. Udden. *Map and Illustration.*

United States—Minneapolis. *J. of G.* **1** (1902): 249–262. **Hall.**
Minneapolis and its Environs. By C. W. Hall. *Maps and Illustrations.*

United States—Minnesota. *J. of G.* **1** (1902): 241–249. **Hall.**
Minnesota. A Sketch. By C. W. Hall. *Map and Illustrations.*

United States—Pacific Slope. **Lemmon.**
Sierra Club B. **2** (1897–98): 61–78, 156–173; **4** (1902): 100–131.
Conifers of the Pacific Slope: How to distinguish them. By John G. Lemmon. *With Illustrations.*

United States—Population. *Rev. G.* **51** (1902): 1–22. **Levasseur.**
La population des Etats-Unis. Par E. Levasseur. *With Map.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *Ann. G.* **11** (1902): 247–259. **Vacher.**
La géographie économique de l'Argentine, à propos d'ouvrages récents. Par Antoine Vacher.

Bolivia. ——
Oficina Nacional de Inmigración, Estadistica y Propaganda Geográfica. Division Político-Administrativa de la República de Bolivia. La Paz, 1902. Size 13 × 8, pp. 24.

Bolivia. **Suarez.**
Notes on Bolivia, compiled and prepared from different sources by Pedro Suarez. London: Unwin Brothers, 1902. Size 8½ × 5½, pp. 80. *Maps and Illustrations. Presented by the Author.*

Bolivia—Boundaries. **Guzmàn.**
Fronteras de Bolivia. Discusion con la Prensa de Chile acerca de la soberania de Bolivia en Chilcaya. Por Alcibiades Guzmàn. La Paz, 1902. Size 7½ × 6, pp. 104. *Presented by the Oficina Nacional de Inmigración.*

Bolivia and Peru. ——
Monthly B. Internat. Bureau American Rep. **12** (1902): 1408–1411.
General Arbitration Treaty celebrated between Bolivia and Peru.
The treaty was signed at La Paz on November 21, 1901.

Brazil—Ceará. *Globus* **82** (1902): 1–5. **Katzer.**
Der landschaftliche Charakter von Ceará (Brasilien). Von Dr. Friedrich Katzer. *With Illustrations.*

Central America—Panama Canal. **Burr.**
Popular Sci. Monthly **61** (1902): 252–268, 304–316.
The Panama Route for a Ship Canal. By Prof. William H. Burr. *With Map and Illustrations.*

Chile. **Hume.**
A Lecture on "The Republic of Chili," including Patagonia, Straits of Magellan, Tierra del Fuego, also Juan Fernandez, given at Junior Constitutional Club, Piccadilly, by Captain David E. Hume, on Thursday, April 10, 1902. London, 1902. Size 8 × 5½, pp. 16. *Presented by the Author.*

Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 604–606. **Bakhuis.**
Een grenskwestie. Door L. A. Bakhuis.
On a still doubtful point in the boundary between French and Dutch Guiana.

Honduras. *Z. Ges. Erdk. Berlin* (1902): 143–164, 231–241. **Sapper.**
Beiträge zur physischen Geographie von Honduras. Von Dr. Karl Sapper. *With Map.*
A careful account of the present position of the Panama canal question, with description of the operations necessary. A comparison with the Nicaragua scheme leads to the conclusion that both are feasible, and no decided advantage in favour of either is shown to exist.

Peru. **St. John.**

Trade and General Condition of Peru for the year 1901. Foreign Office, Annual No. 2807, 1902. Size 9½ × 6, pp. 42. *Price* 2½*d.*

Salvador—Lake Ilopango. *B.R.S.G. Madrid* **43** (1901): 391–397. **Peña.**

El lago de Ilopango. Por D. José Maria S. Peña.

South America. *Globus* **81** (1902): 1–7, 39–46, 69–78, 105–112. **Koch.**

Die Guaikurústämme. Von Theodor Koch. *With Illustrations.*

Tierra del Fuego. **Arçtowski.**

Voyage d'exploration dans la région des canaux de la Terre de Feu. Par Henryk Arçtowski. Bruxelles, 1902. Size 9 × 6½, pp. 34. *Map.*

Uruguay. **Arçtowski.**

Note sur les Dunes du cap Polonio sur la côte de l'Uruguay. Par Henryk Arçtowski.—Notice sur l'abrasion glaciaire, by the same. (Extrait du Bulletin Soc. Belge Géologie, etc., Tome xv., 1901.) Bruxelles, 1902. Size 9½ × 6½, pp. 689–702. *Maps. Presented by the Author.*

Uruguay. **Urioste**

El Clima del Uruguay. Antero Urioste. Size 6½ × 5, pp. 8.

Uruguay—Meteorology. ———

Sociedad Meteorológica Uruguaya. Servicio Pluviométrico. Director: D. Francisco A. Lanza. Resumen de las Observaciones Pluviométricas efectuadas durante el 1er (2o, 3er, 4o) trimestre del año de 1899. Año viii. Montevideo, 1902. Size 11 × 7½, pp. 7, 7, 7, and 7.

Venezuela. *Deutsch. Rundschau G.* **24** (1902): 337–348, 398–407. **Olinda.**

Venezuela in der Gegenwart, Geschildert nach eigenen Eindrücken und Anschauungen. Von Dr. Alexander Olinda. *With Map and Illustrations.*

West Indies. *National G. Mag.* **13** (1902): 209–216. ———

The National Geographic Society Expedition in the West Indies. *With Map.*
Volcanic Islands of West Indies. *With Map.*
Lafcadio Hearn on the island and people of Martinique.

West Indies. *Scottish G. Mag.* **18** (1902): 369–377. **Falconer**

The Evolution of the Antilles. By J. D. Falconer. *With Illustration.*

West Indies. *Popular Sci. Monthly* **61** (1902): 272–281. **McGee.**

The Antillean Volcanoes. By Dr. W J McGee.

West Indies—Martinique. *C. Rd.* **135** (1902): 71–72. **Thierry.**

Sur l'éruption volcanique du 8 mai à la Martinique. Note de M. Thierry.

West Indies—Martinique. *Deutsch. Rundschau G.* **24** (1902): 455–461. **Umlauft.**

Die Katastrophe auf Martinique. Von Prof. Dr. Friedrich Umlauft. *With Map.*

West Indies—Martinique and St. Vincent. **Jaggar.**
Popular Sci. Monthly **61** (1902): 352–368.

Field Notes of a Geologist in Martinique and St. Vincent. By Dr. Thomas Augustus Jaggar. *With Illustrations.*

West Indies—Volcanic Eruptions. *Z. Ges. Erdk. Berlin* (1902): 419–427. **Deckert.**

Die westindische Vulkankatastrophe und ihre Schauplätze. Von Dr. Emil Deckert. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Nineteenth Century* **52** (1902): 43–54. **Douglas.**

Asia and Australasia. By the Hon. John Douglas, C.M.G.

On the possibility of the development of Northern or tropical Australia, without recourse to the immigration of Asiatics.

Australia and Tasmania. **North.**

Nests and Eggs of Birds found breeding in Australia and Tasmania. By Alfred J. North. (Australian Museum. Sydney Special Catalogue, No. i. Second Edition of Catalogue No. xii. entirely re-written, with additions. Part ii.) Sydney, 1902. Size 12½ × 9½, pp. 37–120. *Plates and Illustrations. Presented by the Trustees of the Australian Museum.*

Dutch New Guinea.

Tijds. K. Ned. Aard. Genoots. Amsterdam **19** (1902): 586-592.

De Mrouwke-rivier. *With Map.*

This river enters the sea on the south coast, west of the British boundary.

Dutch New Guinea. **Koning and Oosterzee.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **19** (1902): 592-603.

Het Santani-meer. Het Cycloop-gebergte. De Wilhelmina of Tami-river.

Extracts from reports on visits to the north coast of Dutch New Guinea, near the German boundary.

German New Guinea—Pelew Islands. **Senfft.**

Deutsch. Kolonialblatt **13** (1902): 263-264.

Ueber einen Besuch der Palau-Inseln.

Queensland.—Ethnography. **Roth.**

1902. Queensland. Home Secretary's Department, Brisbane. North Queensland Ethnography. Bulletin No. 4. March, 1902. Games, Sports, and Amusements. By Walter E. Roth. Brisbane, 1902. Size 13 × 8½, pp. 24. *Illustrations. Presented by the Home Secretary, Brisbane.*

Samoa. *Z. Ges. Erdk. Berlin* (1902): 411-418. **Wegener.**

Samoa, Land und Leute. Von Dr. Georg Wegener. *With Illustrations.*

Western Australia. **Brockman.**

Western Australia. Report on Exploration of North-West Kimberley, 1901. By Fred. S. Brockman, with Appendices by Chas. Crossland and Dr. F. M. House. Perth, 1902. Size 13 × 8½, pp. 60. *Map and Illustrations.*

See note in the Monthly Record (*ante*, p. 456).

POLAR REGIONS.

Antarctic—German Expedition. **Drygalski.**

Deutsche Südpolar-Expedition auf dem Schiff *Gauss* unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kiel bis Kapstadt 11. August bis 27. November 1901 und die Errichtung der Kerguelen-Station, mit Beiträgen von Bidlingmaier, v. Drygalski, Enzensperger, Gazert, Philippi, Ruser, Stehr, Vanhöffen, Werth. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin. Herausgegeben von deren Direktor Ferdinand Frhr. v. Richthofen. Heft I. März 1902.) Berlin: E. S. Mittler und Sohn. Size 10½ × 7½, pp. 108. *Maps and Diagrams.*

This is reviewed at p. 222, *ante*.

Arctic. **Nathorst.**

Föreningen Heimdals Folkskrifter 74. Polarforskungen af A. G. Nathorst. Stockholm. P. A. Norstedt & Son. Not dated. Size 8 × 5, pp. 30. *Map. Price* 25 *öre. Presented by the Author.*

MATHEMATICAL GEOGRAPHY.

Astronomy. **Crommelin.**

An Adaptation of Major Grant's Graphical Method of predicting Occultations to the Elements now given in the Nautical Almanac. By A. C. D. Crommelin. London: Royal Geographical Society, 1902. Size 10 × 6, pp. 6. *Diagrams.*

Cartography. **Penfield.**

The Stereographic Projection and its Possibilities, from a Graphical Standpoint. By Samuel L. Penfield. New Haven, Conn.: Tuttle, Morehouse & Taylor Co., 1901. Size 9 × 6, pp. 54. *Diagrams. Presented by the Author.*

Reprint of an article which appeared last year in the *American Journal of Science*.

Longitudes. **Weiss and Schram.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor v. Oppolzer. Nach dessen Tode herausgegeben von Hofrath Prof. Dr. Edmund Weiss und Dr. Robert Schram. XII. Band. Längenbestimmungen. Wien, etc. F. Tempsky, 1900. Size 12 × 9½, pp. viii. and 176.

Map-Projection. *Ann. Hydrographie* **30** (1902): 343-347. **Kleritj.**

Konstruktion der Parallelkreisbilder im Netze der Mercator-Projektion. Von Prof. Ljub. Kleritj.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Botanical Geography. *Ann. G.* **11** (1902): 193-202. **Bonnier.**

La Géographie botanique expérimentale. Par Gaston Bonnier.

See note in the August number (p. 234, *ante*).

Glacial Epoch. *C. Rd.* **135** (1902): 124-126. **Martin.**

Faits nouveaux ou peu connus, relatifs à la période glaciaire. Note de M. David Martin.

Oceanography. ——

List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1901, from H.M. Surveying Ships, Indian Marine Survey and British Submarine Telegraph Companies. Hydrographic Department, Admiralty, London, 1902. Size 13 × 8½, pp. 46. *Presented by the Hydrographic Department, Admiralty.*

Oceanography. *C. Rd.* **134** (1902): 1606-1607. **Thoulet and Chevallier.**

Sur la densité des eaux océaniques. Note de MM. Thoulet et Chevallier. (Extrait.)

Oceanography—Atlantic. **Richard.**

Campagne Scientifique de la "Princesse Alice" en 1901. Par le Dr. J. Richard. (Extrait du *Bulletin de la Société Zoologique de France*, Année 1902, pp 81-104.)

Oceanography—Currents. *Asien* **1** (1902): 138-140. **Livonius.**

Der Golfstrom und der Kuro-Siwo. Von O. Livonius.

Oceanography—North Atlantic. **Lundbeck.**

The Danish Ingolf-Expedition, vol. vi. Part i. Porifera (Part i.) Homorrhaphidæ and Heterorrhaphidæ. By Will. Lundbeck. Translated by Torben Lundbeck. Copenhagen: H. Hagerup, 1902. Size 13 × 10½, pp. 108. *Plates. Presented by the Zoological Museum, Copenhagen.*

Physical Geography. *Vierteljahrs. G. Unterricht.* **1** (1902): 203-211. **Machaček.**

Eduard Suess, Das Antlitz der Erde. III. Band, I. Th. Von Dr. Fritz Machaček.

A detailed analysis of the work.

Terrestrial Magnetism. *Ann. Hydrographie* **30** (1902): 299-304. **Sachse and Koldewey.**

Magnetische Beobachtungen an Bord der "Valdivia" während der deutschen Tiefsee-Expedition 1898-99. Ausgeführt vom Navigationsoffizier Herrn W. Sachse. Bearbeitet von Admiralitätsrath Koldewey.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Crime. **Reiner.**

Deutsch. Rundschau G. **24** (1902): 393-398.

Das Verbrechen vom Standpunkte der Geographie. Von Dr. Julius Reiner.

Commercial Geography. **Dubois, Kergomard, and Laffitte.**

Précis de Géographie Économique par MM. Marcel Dubois et J. G. Kergomard. Deuxième Édition revue et corrigée avec la collaboration de M. Louis Laffitte. France, Europe, Asie, Océanie, Afrique, Amérique. Paris: Masson et Cie., 1903 [1902]. Size 9 × 5½, pp. viii. and 838. *Price 8 fr. Presented by the Publisher.*

BIOGRAPHY.

Adams. *M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens* **8** (1902): 239-253. **Reiss.**

William Adams und sein "Grab" in Hemimura. Von Ludwig Reiss.

Prof. Reiss, whose researches into the early dealings of Europeans with Japan have extended over some years, comes to the conclusion that Adams was buried at Hirado, where he died, though a monument was erected by his friends at Hemimura.

Bettoni. *B.S.G. Italiana* **3** (1902): 487-493. **Bertacchi.**

Angela Bettoni-Palermo, già vedova Haimann, e l'illustrazione della Cirenaica. Di Cosimo Bertacchi.

Signora Bettoni accompanied her husband, Giuseppe Haimann, during his expedition to Tripoli in 1881. She was born in 1848, and died at Rome in April last.

Brahe. **Burckhardt.**

Zur Erinnerung an Tycho Brahe 1546–1601. Vortrag gehalten am 23 Oktober 1901 in der Naturforschenden Gesellschaft in Basel 300 Jahre nach dessen Tode. Von Fr. Burckhardt. Basel: Georg & Co., 1901. Size 9 × 5½, pp. 26. *Facsimile.*

Gaboury. **Dugast.**

The First Canadian Woman in the North-West, or the Story of Marie Anne Gaboury, Wife of John Baptiste Lajimonière, who arrived in the North-West in 1807, and died at St. Boniface at the Age of 96 years. By M. L'Abbé G. Dugast. (Historical and Scientific Society of Manitoba. Transaction No. 62.) Winnipeg, 1902. Size 9 × 5½, pp. 32. *Presented by the Historical and Scientific Society of Manitoba.*

Haënke. *B.R.S.G. Madrid* **43** (1901): 310–323. **Duro.**

Tadeo Haënke. Naturalista en el viajo alrededor del mundo de las corbetas *Descubierta* y *Atrevida*, al mando de D. Alejandro Malaspina, desde 1789 á 1794. Por D. Cesáreo Fernández Duro.

Nieuwenhuis. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 553–577. **Hasselt.**

Feestrede ter gelegenheid van de plechtige ontvangst van Dr. A. W. Nieuwenhuis te Amsterdam, uitgesproken door Prof. A. L. van Hasselt.

Describes the work of the well-known explorer of Borneo.

Scherzer. **Reingruber.**

Gallerie denkwürdiger Personen der K. K. Hof- und Staatsdruckerei. Von Josef Reingruber. [Dr. Karl Ritter von Scherzer.] Size 7½ × 5½, pp. 139–158. *Portrait. Presented by Dr. Karl v. Scherzer.*

Dr. von Scherzer, who is an honorary corresponding member of our Society, is best known to geographers for the part he took in the voyage of the *Novara* in 1857–59.

GENERAL.

Educational. *Vierteljahrs. G. Unterricht.* **1** (1902): 220–224. **Mosshammer.**

Die symmetrischen Erinnerungsbilder beim memorialen geographischen Zeichnen. Von Dr. Franz Mosshammer. *With Diagrams.*

On the difficulties arising from reversed mental pictures, especially in the case of left-handed or ambidextrous pupils, in the drawing of maps from memory.

Encyclopædia Britannica.

The New Volumes of the Encyclopædia Britannica, constituting, in combination with the existing volumes of the Ninth Edition, the Tenth Edition of that work, and also supplying a New, Distinctive, and Independent Library of Reference dealing with recent events and developments. Vols. xxv., xxvi., and xxvii. of the complete work. Edinburgh and London: A. & C. Black and the *Times*, 1902. Size 11½ × 9, pp. (vol. xxv.) (A.–Aus.) xiv. and 808; (vol. xxvi.) (Aus.–Chi.) xxii. and 764; (vol. xxvii.) (Chi.–Eld.) xx. and 744. *Maps and Illustrations.*

These will be specially noticed.

Geography. *Riv. G. Italiana* **9** (1902): 217–240. **Marinelli.**

Alcune questioni relative al moderno indirizzo della geografia. Per Prof. Olinto Marinelli.

Ocean Routes. **Chave.**

Distances, Courses, and Maritime Positions on the Routes of the Union Castle Line Steamers between England, the Continent, and South Africa, Madagascar, and Mauritius. Computed and arranged by Benjamin Chave. 1899. Second Edition. Southampton and London. Size 6 × 5, pp. 22. *Price* 1s. 6d. *Presented by the Author.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Central Europe. **Liebenow and Ravenstein.**

Liebenow-Ravenstein's Special-Radfahrerkarte von Mittel-Europa. Scale 1: 300,000 or 4·7 stat. miles to an inch. Sheets: 84, Köln; 98, Prüm. Frankfurt-a-M.: Ludwig-Ravenstein.

This map is now published in two forms, one being a revision of the earlier topo-

graphical and political edition, and the other, based upon the former, an edition showing roads in red, distances between places in kilometres, and other information likely to be of service to cyclists and automobilists, for whom it has been specially prepared. The character of each road is indicated by the style in which it has been drawn. When complete, the map will consist altogether of a hundred and sixty-four sheets, of which about ninety are now published. The above sheets belong to the cyclists' edition of the map.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from August 1 to 31, 1902.

1 inch:—

With hills in brown or black, 84, 115, 149, 166 (engraved). 1*s. each.*

6-inch—County Maps:—

Cambridgeshire, 24 S.E., 28 N.E., 32 S.E. **Dorsetshire,** 3 S.E., 4 N.W., 7 S.E., 8 S.E., 14 N.W., N.E., S.W., 15 N.W., S.W., 16 N.W., N.E., S.W., 17 N.W., S.W., 23 S.E., 24 N.W., N.E., 25 N.E., S.W., S.E., 26 N.W., N.E., 33 N.E., S.W., S.E., 34 N.W., S.E., 35 N.E., S.E., 56 S.W., 57 N.W., 59 N.W., N.E. **Huntingdonshire,** 15 S.E., 18 N.E., 19 N.E., S.W., 22 S.E. **Monmouthshire,** 3 N.W., 4 N.W., 30 N.W., 31 N.W. **Shropshire,** 1 S.E. **Staffordshire,** 45 N.W., S.W., 46 N.W. 1*s. each.*

25-inch—County Maps:—

Cambridgeshire, IV. 1; XVII. 14; XXII. 11, 14, 15, 16; XXIII. 1, 5; XXV. 3, 13, 16; XXVI. 2, 3, 4, 5, 6, 9, 12, 13, 16; XXVII. 2; XXIX. 3; XXX. 1, 2, 5; XXXVIII. 8, 12; XLV. 4, 8, 12, 13, 14, 15, 16; LI. 4; LII. 1, 3, 4, 6, 7, 8, 10, 11, 12, 14; LVII. 2, 6. **Dorsetshire,** XXII. 2, 4, 7, 8, 9, 10, 12, 14; XXXI. 2, 6; XXXIX. 12; XL. 1, 4, 5, 6, 7, 16; XLVII. 1, 5, 6, 13; LIII. 8; LV. 5, 9. **Gloucestershire,** X. 4; XXV. 11, 16; XXX. 11, 12, 15; XXXI. 1, 2, 5, 6, 16; XXXIII. 3, 4, 6, 7; XXXIV. 10, 11, 12, 14; XXXV. 14; XXXVI. 2, 3, 6, 16; XXXVIII. 7; XL. 7; XLIX. 3, 8; LIX. 2. **Huntingdonshire,** XXVIII. 4, 8, 12, 13. **Montgomeryshire,** XXIII. 16; XXX. 2, 3, 4, 9, 10, 11, 13, 14, 15; XXXVI. 10, 11, 15; XXXVII. 3; XLI. 5, 6, 7, 8, 10, 15; XLII. 8, 13, 15, 16; XLIII. 1. **Shropshire,** XXXIV. 11; XXXVI. 12; XXXVII. 15, 16; XXXVIII. 13; XLI. 10, 11; XLII. 1, 2, 3, 5, 6, 9, 11; XLIV. 3, 4, 6, 7, 8, 10, 12, 14, 15, 16; XLV. 1, 5, 9; LII. 2, 3, 4, 8; LIIA. 1. **Staffordshire,** XXII. 2, 3, 9, 14; XXVII. 4; XXVIII. 5, 6, 7, 11, 12, 15, 16; XXXV. 4, 7, 11; LVI. 1, 2, 5, 9, 10, 11, 12, 13; LVII. 1, 3, 6, 8, 13; LXII. 3, 4; LXIII. 1, 4; LXIV. 1; LXV. 1, 2. **Worcestershire,** XV. 3, 4; LIII. 16. **Yorkshire,** CCXC. 12; CCXCI. 9; CCXCVI. 2, 3, 4, 7, 8, 10, 11, 12. 3*s. each.*

England and Wales. **Geological Survey.**

Maps (1-inch). New Series (colour printed). Ringwood, Sheet 314. *Price* 1*s.* 6*d.* (Drift Edition.)

MEMOIRS:—

Exeter, Geology of the country around, 2*s.* (Explanation of sheet 325.)
Ringwood, Geology of the country around, 1*s.* (Explanation of sheet 314.)
Southampton, Geology of the country around, 1*s.* 6*d.* (Explanation of sheet 315.)
(*E. Stanford, London Agent.*)

England and Wales. **Bartholomew.**

Cyclists' Road Map of the Birmingham District. Reduced from the new revised Ordnance Survey. Scale 1: 126,720 or 2 stat. miles to an inch. Edinburgh: John Bartholomew & Co., 1902. *Price* 1*s.* 6*d., mounted on cloth. Presented by the Publishers.*

Except that the main roads are shown in brown, this map is uncoloured. Contour lines are shown, but no orographical tinting. This sheet extends from Eccles on the north to Evesham on the south, and from Shrewsbury on the west to Leicester on the east.

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1: 126,720 or 2 stat. miles to an inch. Sheet 11, North Wales. Edinburgh: John Bartholomew & Co. *Price* 2*s. mounted on cloth. Presented by the Publishers.*

This sheet includes the whole of Anglesey and Carnarvon, and portions of Merioneth, Denbigh, and Flint. Like the rest of the series to which it belongs, the relief is very clearly shown by contour lines and carefully selected tints of colour. The character of the roads is clearly indicated by the style in which they are drawn, and altogether the map will doubtless be most serviceable to cyclists and tourists generally.

Italy. **Instituto Geografico Militare, Florence.**

Carta d'Italia. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 109, Pesaro; 115, Citta di Castello; 116, Gubbio; 117, Jesi; 123, Gualdo Tadino; 124, Macerata, 125, Fermo; 131, Foligno; 132, Norcia; 133, Ascoli Piceno; 135, Orbetello. Instituto Geografico Militare, Florence, 1900.

Norway. **Norges Geografiske Opmaaling.**

1. Topografisk kart over kongeriget Norge. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: J 15, Svartisen; K 15, Dunderlandsdalen; L 15, Nasa. 1902. *Price kr.*0 60 *each sheet.* With index.—2. Kart over Sondre Trondhjems Amt. Scale 1 : 200,000 or 3 2 stat. miles to an inch. 1901. *Price kr.*1.00. Christiania: Norges Géografiske Opmaaling. *Presented by Col. G. E. Church.*

AFRICA.

Eritrea. **Instituto Geografico Militare, Florence.**

Carta della Eritrea. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 1, Valle del Giaghe; 2, Mai Adartè; 8, Agordat; 9, Dega; 10, Melanzane; 15, Suzenà; 16, Ferfer; 17, Mai Aibò; 22, Tolè. Florence: Instituto Geografico Militare. *Price lire* 1.5 *each sheet.*

Tunis. **Service Géographique de l'Armée, Paris.**

Tunisie. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Sheets: Nos. XXXV., Zaghouane; XLII., Djebel Fkirine; XLIII., Enfida; LXIV., Sidi el Hani; LXXIV., Mahdia; LXXXII., La Chebba. *Price* 1.50 *fr. each sheet.*—Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: Nos. XXVIII. Djebel Harraba; XXIX., Ksour; LI., Djebeniana. *Price* 1.50 *fr. each sheet.* Service Géographique de l'Armée, Paris.

AMERICA.

Brazil. **Pessanha.**

Carta do territorio do Aricary incorporado ao Estado do Pará, Republica dos E. U. do Brazil. Execução e desenho de José Lobo Pessanha. Scale 1 : 2,000,000 or 31·5 stat. miles to an inch. Para, 1901. *Presented by W. A. Churchill, Esq.*

Shows the territory awarded to Brazil by the decision of the Swiss Government Arbitration in December, 1900, as well as the finally arranged boundary between French Guiana and Brazil. It is merely a sketch-map, with little detail.

Martinique. **Epois.**

Carte générale de la Martinique publiée sous le patronage du Government de la Martinique. Dressée d'après la Carte du Service Hydrographique de la Marine et complétée par M. J. Epois, d'après les documents officiels de la Colonie. Scale 1 : 80,000 or 1·2 stat. mile to an inch. Paris: Augustin Challamel. 1902.

This general map of Martinique is on a sufficiently large scale to show a fair amount of detail. It has been compiled from the latest available information previous to the disastrous volcanic eruptions which have considerably modified the physical features of the northern part of the island. These changes are not indicated, but doubtless a new edition will be published before long upon which they will be shown, and a comparison of the two will be interesting. The map is well drawn, and printed in colours.

GENERAL.

World. **Sohr-Berghaus.**

Neuer zeitgemässer Bearbeitung von Sohr-Berghaus Hand-Atlas über alle Teile der Erde, herausgegeben von Prof. Dr. Alois Bludau. Früher herausgegeben von F. Handtke. Neunte Auflage. Lieferung I. Glogau: Carl Flemming, 1902. *Price* 1 *m. each part.*

This is the first part of the ninth edition of a popular German atlas, which has been corrected and brought up to date. When complete it will consist altogether of eighty-four sheets, with over a hundred and fifty maps, and is to be published in thirty parts, each containing two or three sheets. One part will be published every three or four weeks, at a uniform price of one mark. The present issue contains the following maps: No. 8, Europe, physical, 1 : 15,000,000; No. 61, Africa, physical, 1 : 20,000,000; No. 66, the north-eastern sheet of a general map of Africa, in five sheets, on the scale of 1 : 10,000,000. The first two maps show relief by a combination of hachuring and

colour tinting, with a result that cannot be considered altogether satisfactory, and the latter, though containing a great deal of information, is somewhat overcrowded and indistinct. On all the maps the depths of the ocean are indicated by tints of blue.

World. **Stieler**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich. 8 Lieferung. Sheets, Nos. 80 and 84. Gotha: Justus Perthes. *Price* 60 *pf.*

The two maps contained in this part of the new edition of Stieler's Hand-Atlas are —No. 80, the south-east sheet of a map of Australia, on the scale of 1 : 5,000,000, by Dr. H. Haack, and No. 84, Eastern Canada, on the scale of 1 : 7,500,000, by H. Habenicht. The former includes Southern Queensland, New South Wales, Victoria, and the eastern part of South Australia, and the latter all that portion of the Dominion of Canada south of Hudson strait, and east of the western shores of Hudson bay. Both are entirely new maps, and most creditable productions.

CHARTS.

North Atlantic Ocean and Mediterranean. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for September, 1902. London: Meteorological Office. *Price* 6*d.* *Presented by the Meteorological Office, London.*

Norway. **Norges Geografiske Opmaaling.**

Specialkarte over den Norske Kyst fra Ure til Brettesnes. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Christiania: Norges Geografiske Opmaaling, 1902. *Price kr.*1.00. *Presented by Col. G. E. Church.*

Norway. **Norges Geografiske Opmaaling.**

Oversigtskart i 1 : 2,400,000 over de af Norges Geografiske Opmaaling udgivne Kystkarte samt over Dyblodningen til 1ste April 1902. Christiania: Norges Geografiske Opmaaling. *Presented by Col. G. E. Church.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for August, and of the North Pacific for September, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Argentine Republic. **Sociedad Fotografica Argentina de Aficionados.**

One hundred and twenty Photographs of the Argentine Republic, taken by the Sociedad Fotografica Argentine de Aficionados. *Presented by Colonel Sir Thomas H. Holdich, R.E., K.C.I.E., C.B.*

These fine large photographs have been mounted and bound in seven handsome albums. As will be seen from the titles, the greater number of them represent the Argentine army and navy, and government institutions and public buildings of Buenos Aires and La Plata. They have been brought home by Sir Thomas Holdich on his return from his recent visit to South America in connection with the Chilo-Argentine Boundary Arbitration, and presented by him to the Society.

Buenos Aires: (1) Naval school; (2) Cadets of the naval school; (3) Workshops of the naval arsenal; (4–16) Battleships and cruisers of the Argentine Republic; (17) Infantry of the military school; (18) Cavalry of the military school; (19) Artillery of the military school; (20) A company of the 10th Regiment of Infantry; (21) The 2nd Regiment of Artillery; (22 and 24) 9th Cavalry Regiment of Guards (President's escort); (23) Squadron of guards; (25) Corps of bombardiers; (26) Military arsenal; (27) Military hospital; (28) Tiro federal; (29–32) Government buildings; (33) Vestibule, Government buildings; (34) House of Congress; (35) National Supreme Court; (36) Central department of police; (37) National penitentiary; (38) Facultad de Medicina; (39) Facultad de Ciencias y Letras; (40 and 41) Escuela Normal de Profesores; (42) Colegio Petronila Rodriguez; (43) Colegio Sagrado Corazón; (44) Colegio Avellaneda; (45) Colegio Sarmiento; (46) Escuela Graduada de Varones; (47) Colegio Zorrilla; (48) Caja de Conversion; (49) Municipalidad; (50) Aguas Corrientes bank; (51) Aguas Corrientes pumping station; (52) Aguas Corrientes reservoirs; (53) Commercial exchange; (54) Teatro Colon; (55) Teatro opera; (56) Teatro Argentino; (57) South railway station; (58) west railway station; (59) Casa Amarilla; (60) Pabellon Argentino; (61) Bon Marché; (62) Hotel Metropole; (63) Splendid hotel; (64) Jockey club (exterior); (65) Jockey club (interior); (66) Club del Progreso; (67) Editorial offices of *La Nacion*; (68)

Editorial offices of *La Prensa*; (69) Asistencia Publica; (70 and 71) Asilo Mendigos; (72) Hospital Rawson; (73) Children's hospital; (74) Aliens' hospital; (75) Hospital Rivadavia; (76) Entrada Chacarita; (77) The cathedral; (78) Santa Domingo church; (79) Nuestra Señora de la Merced church; (80) Carmen chapel; (81) Santa Felicitas church; (82) Padres Pasionistas church; (83) Interior of dome of Salvador church; (84) Interior of the Padres Pasionistas church; (85 and 86) Plaza de Mayo; (87 and 88) Avenida de Mayo; (89) Belgrano's statue; (90, 96, and 97) Avenida Alvear; (91) Plaza Libertad; (92) Calle Callao; (93) General S. Martin's statue; (94) Calle Sta. Fe; (95) General view of the convent gardens; (98) Sarmiento's statue; (99 and 100) Landscape, Palermo; (101) Grand stand on the racecourse; (102) Racecourse; (103) South docks; (104) Shipping scene; (105) New model market; (106) Central fruit market; (107) Frozen meat stores.—La Plata: (108) Government buildings; (109) Legislatura; (110) Municipal buildings; (111) Direction of schools; (112) The museum; (113) Law Courts.—(114) Brewery, Quilmes; (115) Law Courts, Rosario Santa Fe; (116) The cathedral, Salta; (117–120) Views in Tierra del Fuego.

Canada. **Wheeler.**

Seven Photographs of the Selkirk Range, Canada. Taken by A. O. Wheeler, Esq. *Presented by A. O. Wheeler, Esq.*

An excellent set of photographs, measuring about 9 × 12 inches. The following are the titles:—

(1) The Canadian Pacific Railway in the Illecillewaet valley; (2) The Illecillewaet valley; (3) Mount Sir Donald and the Illecillewaet glacier; (4) Stony creek and Mount Shaughnessy; (5) Stony creek bridge and Beaver river valley; (6) Looking north from Rogers pass; (7) Mts. Cheops and Napoleon.

India. **Crookshank.**

Twenty-seven Photographs of Kashmir. Taken by Lieut. A. A. Crookshank, R.E. *Presented by Lieut. A. A. Crookshank, R.E.*

A most successful series of photographs taken during the summer and autumn of 1900, interesting alike from a geographical and anthropological point of view.

(1) Group of Mohammedans of Akhu, Chinese Turkistan, returning from a pilgrimage to Mecca, photographed at Drás; (2) Village of Gya, south of Leh; (3) Camp of Chámpas at Debring, near Takalang pass, black tents of yák's and goat's hair; (4) The larger of two salt lakes, "Tsokar," in Rukshu, looking east and south-east across the lake from north-west corner, altitude 14,900 feet; (5) The larger of two salt lakes, "Tsokar," looking north-east across the lake from Rigul; (6) View of both salt lakes, called "Tsokar," from hills above Pizuli camp, Lieut. Crookshank's Kashmiri Shikari in foreground; (7) "Karzok" (upper) chief encampment of the Chámpas, on west shores of Tso-Moriri lake—snow hills behind are 20,600 feet; (8) Tso-Moriri lake in Rukshu, altitude 14,900 feet; (9) Tso-Moriri lake from centre of east shore looking west, snow hills behind are same as seen in photograph No. 7; (10) Winter quarters of the chief of the Chámpas, near lake Lam Tso Tagazung, Rukshu, altitude 15,000 feet; (11) The Ovis Ammon—horns are 38 inches long; (12) The Goa or Tibetan gazelle, horns 14½ inches long; (13) Lake at head of Lamambum Nullah, east of Chumár Tagazung, altitude over 20,000 feet; (14) Snow-peaks, altitude 21,176 feet, south-west of Chumár, with the Parechu or Párang-tso river below; (15) Snow-range (nearest peak 21,176 feet) lying to the south-west of Chumár; (16) The Tso-Moriri lake, from hills to the south-south-east, snow-peaks behind 20,600 feet, east of Nurbu-Sumdo; (17) The Tso-Moriri lake, from hills to the south, view up the lake from the north; (18) Rockoláma Nullah, drains into the Parechu river from the south and about midway between Nurbu-Sumdo and the Párang Lá; (19) Looking down the Parilungbi river in Spiti from below the Párang Lá pass; (20) The Parilungbi river north of Kibber village in Spiti; (21) Snow-clad peaks in Spiti, east of Kibber village; (22) Village of Kibber in Spiti; (23) Village of Ki in Spiti, on the Spiti river; (24) The burhel of Spiti, horns 22 inches long; (25) Red bear of Spiti at Lursa; (26) The suspension bridge over the Sutlej river at Wangtu; (27) The valley between Paunda and Taranda on the Hindustan-Tibet road, upper Sutlej valley.

Naga Hills. **Furness.**

Forty-seven Photographs of the Naga Hills, Northern Assam. Taken by Dr. W. H. Furness. *Presented by Dr. W. H. Furness.*

This album forms a valuable addition to the Society's collection, especially as Dr. Furness has been careful to select subjects of geographical interest. The natives, their dwellings, and mode of life are all represented, as well as the scenery of the region.

The photographs are platinotypes, measuring about 4½ × 6½ inches. Their titles are as follows:—

(1) View over the Naga hills from Koio; (2) "Morang" or batchelors' house of the village of Tamlu, Miri Nagas; (3) The headman of the middle "Khel" or ward of Tamlu; (4) Wood-carriers, Tamlu; (5 and 6) Sacred tree in burying-ground at Tamlu; (7) Head-hunters trophies hanging beneath the eaves of a house at Tamlu; (8) Headman of Naogong in war costume, Ao Nago: (9) Village of Naogong; (10) Heads made of gourds and of wood to recall a head-hunting raid; (11) Street in Naogong; (12) The front of a house, Naogong; (13) Interior of an Ao Naga house, Naogong; (14) Front of the "Morang" and public council platform, Naogong; (15) Wooden gong on which the alarm is struck in times of attack on the village; (16) Ao Nagas—the collars of boar tusks on the men indicate successful head-hunters; (17) Ao Nagas; (18) A sacrificed dog being cut in small pieces with a knife of bamboo, and distributed throughout the village, thereby effecting a cure for fever; (19) Graveyard at Naogong; (20) Wild bull of the Naga hills (Bos frontalis); (21) Ao woman, village of Nunkum; (22) Ao woman; (23) The headman of Nunkum, Ao Nagas; (24) Unmarried girls of Hungtang, Sema Nagas; (25) Sema Nagas; (26) Weaving, Sema Nagas, Hungtang; (27) Women of Sema tribe carding cotton; (28) Married woman of Hungtang, Sema Naga; (29) The front posts of a "Morang"; (30) Recently made grave hung with the possessions of the deceased; (31) Rengma Naga woman; (32) Rengma Naga, Kotsana; (33) Front of "Morang" in Rengma, Naga village; (34) Rengma children; (35) Side view of a "Morang;" (36) Beggars in a Rengma village; (37) Nerhama, Angami Nagas; (38) House of a rich man of Nerhama; (39) Angami Naga youths, carrying horns of "Zu," a mild rice-beer; (40) Angami woman; (41–43) An Angami war-dance; (44) Angamis in festival costume; (45) A monumental boulder dragged into a village to commemorate a feast given by a rich man as a tribute to the memory of his dead father; (46) The house of the wealthy citizen who gave the feast, Maothana Angami Nagas; (47) Tunkhul Nagas.

New Guinea. **Guise.**

Five Photographs of native tattooed women of British New Guinea. Taken by R. E. Guise, Esq. *Presented by R. E. Guise, Esq.*

In 1900 Mr. Guise presented an important set of photographs of New Guinea to the Society, and these which he has now sent form an interesting supplement to them from an anthropological point of view. They are as follows:—

(1) Photograph showing tattooing of marriageable girls; (2, 4, and 5) Study of tattooing of maidens at Hood Point, Central Division; (3) Back view of tattooed girl.

Tibet and China. **Kozloff.**

Five Photographs of Tibet and China. Taken during Captain Kozloff's Expedition, 1899–1901. *Presented by Captain Kozloff.*

A short account of the important expedition during which these photographs were taken was given in the *Geographical Journal* for May last. The following is a list of the titles:—

(1) One of the gorges of the upper Mekong; (2) Captain Kozloff making astronomical observations while wintering in Kam, east Tibet; (3) Beggars at Kam; (4) Small town of Kuan-go-chen, never before visited by a European, in the Kan su Province; (5) A Mongol of Tsaidam, who went with the expedition.

West Indies. **Wilson.**

Seven Photographs of St. Vincent. Taken after the eruption of May, 1902, by J. E. Wilson, Esq. *Presented by E. André, Esq.*

These photographs give a good idea of the havoc wrought by the recent volcanic eruption in St. Vincent.

(1) Between Lot 14 Estate and Orange hill, said to have been level and in cane cultivation, now gutted (top of Soufrière seen); (2) A height of 2000 feet below Soufrière, American scientists in the foreground; (3) Between Lot 14 Estate and Soufrière, once a forest, now a furnace (top of Soufrière seen); (4) Richmond sea-shore—quarter of a mile of land sank; (5) Richmond House, showing the gutted appearance of the land; (6) Richmond Great House, showing the wave-like appearance of the land—a family of nine supposed to be buried among the ruins; (7) Wallabon works, slight eruption taking place in the distance, four hundred dwellings have disappeared.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

¼-inch Scale.

	Price per sheet. s.	d.
1. England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper . .	1	6
2.*England and Wales, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 22½ × 15 inches. On paper	1	6
3.*Scotland, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude marked, no hill shading or contours. Size 18 × 12 inches. On paper	1	0
4.*Scotland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18 × 12 inches. On paper	1	0
5.*County and District Maps of Great Britain, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. In sheets. Unmounted . . . . . 6*d.* and	1	0
Folded in covers . . . . . 9*d.* and	1	0

1-inch Scale.

6. England and Wales, old series, in black, with outline and hill hachures. Size 36 × 24	2	6
Size 18 × 12	1	0
7. Ditto, new series, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
8.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
9.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
10.*Ditto, hills hachured in brown, contours red, roads sienna, water blue, magnetic variation shown, latitude and longitude not marked. Size 18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1	0
Combined sheets	1	6
11. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1	9
12.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1	6
13. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0

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19. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches 2 6

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27.*Index to the sheets of the 6-inch scale map, parishes coloured.
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Nos. 27 and 28 are identical with Nos. 7 and 11, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

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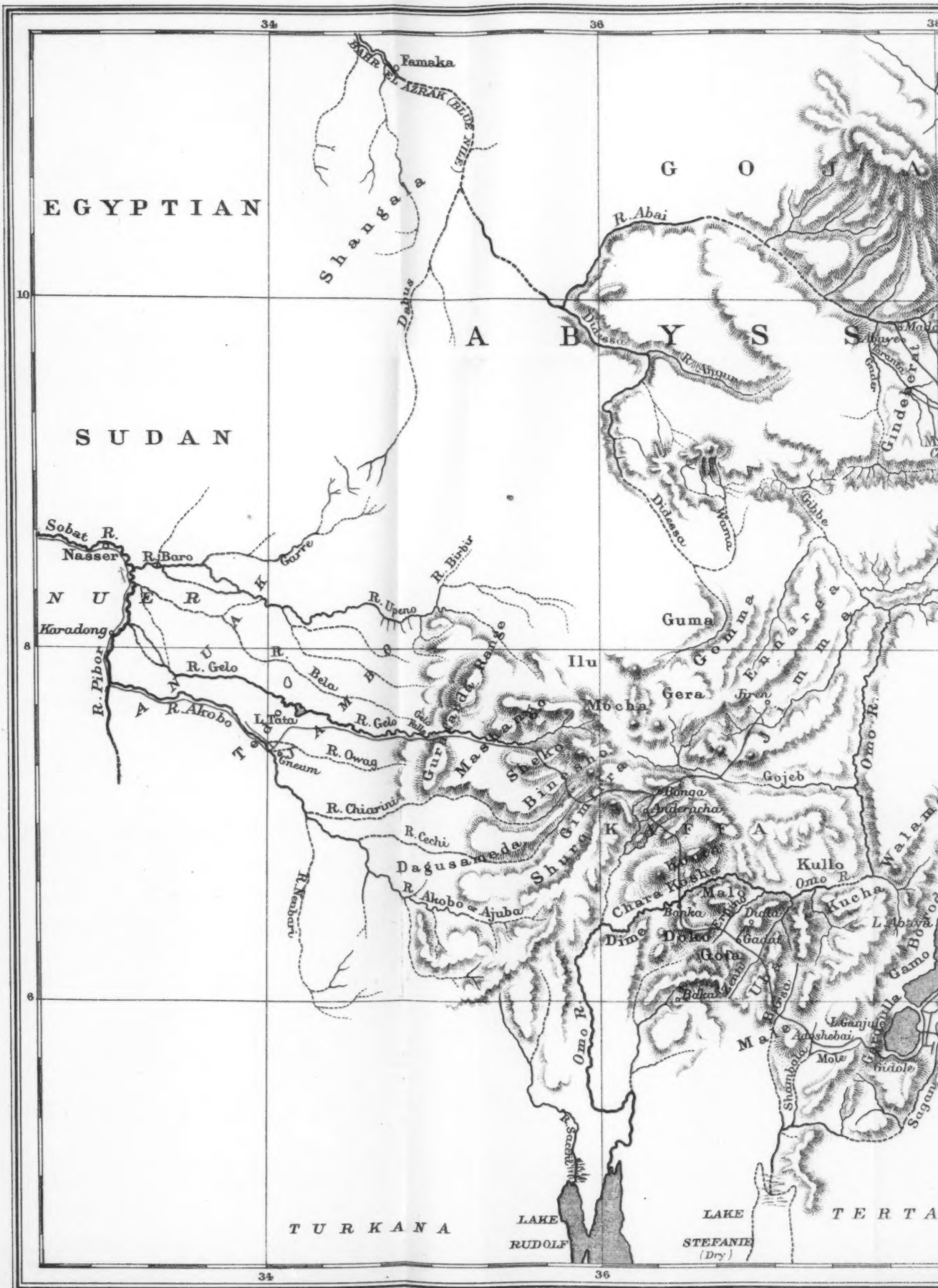

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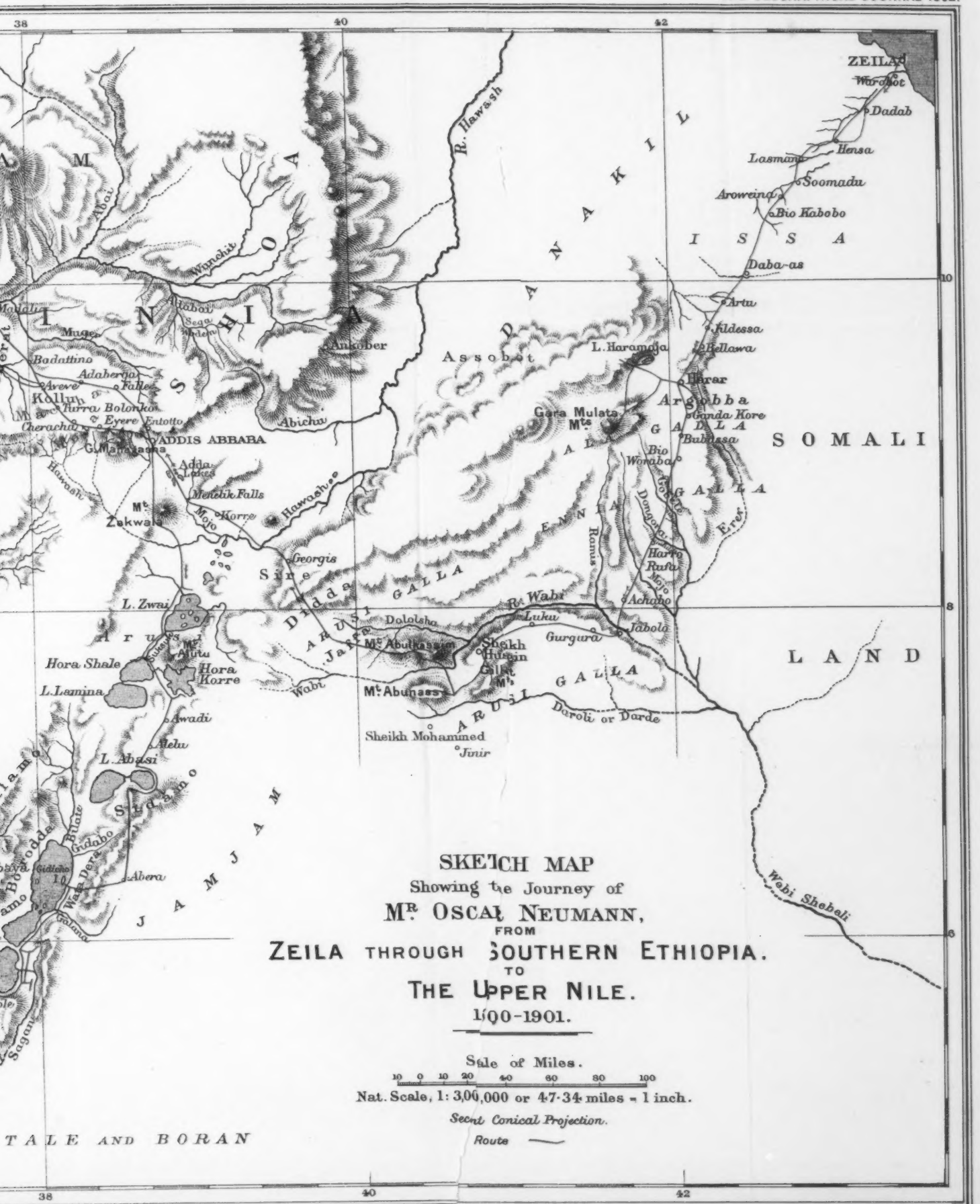

SKETCH MAP

Showing the Journey of

Mr. OSCAR NEUMANN,

FROM

ZEILA THROUGH SOUTHERN ETHIOPIA.

TO

THE UPPER NILE.

1900-1901.

Scale of Miles.

10 0 10 20 40 60 80 100

Nat. Scale, 1: 3,00,000 or 47·34 miles = 1 inch.

Secnt Conical Projection.

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